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'N SELDSAME OORSAAK VIR 'N KRONIESE HOES

C. VAN BERGEN, B.Sc., M.B., B.Ch. (PRETORIA) *en* M. E. OLIVIER, B.Sc., M.B., B.Ch., (PRETORIA)
Lydenburg

Geskiedenis. Die moeder het die pasiënt, 'n dogter van 12 jaar oud, gebring en gekla dat sy vir die afgelope vier jaar hoes. Dit was 'n droë non-produktiewe hoes; op geen tydstip het sy ooit bloed opgehoes nie. Hierdie hoesbuie het sy dwarsdeur die jaar gekry; dit was nooit erger gedurende enige spesifieke jaargety nie. Verandering van klimaat of omgewing het dit geensins verbeter of vererger nie. Sy het nooit enige moeilikheid met asemhaling gehad nie en haar bors het nooit toegetrek nie. Daar was geen gewigsverlies of nagsweet nie en ook geen familiegeskiedenis van 'n kroniese longaandoening nie.

Gedurende die dag as sy aktief is en buite speel het sy baie lastige hoesbuie ondervind en haar nagrus was soms ook verstoor deur aanhoudende hoes.

Verder was daar geen klagtes nie. Die pasiënt het 'n goeie eetlus gehad, gereelde opelyf, geen frekwensie of dysurie, geen oor, neus of keel klagtes nie.

Vorige Geskiedenis. Op die ouderdom van drie jaar het sy kinkhoes gehad en op ses jaar het sy masels gehad.

Bevindinge by Ondersoek: *Algemeen.* 'n Jong dogter in haar puberteitsjare, liggaamlik goed ontwikkel, geen tekens van anaemie, geen trommelstokvingers nie.

Cardio-Vasculer. Bloeddruk 90/60 mm. Hg., pols 100 per minuut, geen kliniese vergroting of verplasing van die hart nie. Hartklanke normaal, geen geruise nie.

Asemhalings-Stelsel. Borskas goed ontwikkel, geen assimmetrie nie, bewegings eweredig, uitsetting normaal. Met palpasie, perkussie en auskultasie is niks abnormaals waargeneem nie. Röntgen plate van die longe is geneem; die resultate hiervan was negatief.

Abdomen. Bewegings normaal, geen geswelle of uitgesette vate nie, geen vergrootte lewer of milt nie, geen teerheid of spierspanning nie.

Sentrale Senustelsel. Craniaal senus normaal, geen motoriese of sensoriese stoornisse nie, reflexe almal teenwoordig en eweredig aan beide kante.

Bloed. Witbloedsel telling 9,550 per c. mm. Bloedbesinking 12 mm. (Westergren gedurende die eerste uur.

Oor, Neus en Keel. Geen keel of neus pathologie was gevind nie. In die regter uitwendige oorkanaal is 'n vreemde voorwerp waargeneem. Daar is getrag om die voorwerp te verwyder met 'n oorspuit maar sonder sukses. Onder algemene narkose is 'n kraal ongeveer so groot soos 'n klein ertjie sonder veel moeite verwyder.

Die pasiëntjie is die volgende dag uit die hospitaal ontslaan en tot op datum, 18 maande ná die verwydering van die kraal, het sy nog geen verdere las gehad van hierdie hoes nie.

Op ondervraging kon nóg sy nóg haar moeder onthou dat sy ooit met krale gespeel het of dat sy probeer het om 'n kraal in haar oor te druk nie.

Diskussie. In hierdie geval is die pasiënt deeglik ondersoek vir haar hoes en geen long pathologie kon aangetoon word nie. Wat belangrik is, is dat dit 'n droë non-produktiewe hoes was wat haar skynbaar veel meer las gegee het wanneer sy aktief was. Direk ná die verwydering van die kraal het haar hoes opgeklaar. Die feit dat sy haarself gladnie kon herinner dat sy met krale gespeel het nie kan mens laat aanneem dat die voorwerp baie lank in haar uitwendige oorkanaal moes gewees het.

'n Verklaring vir hierdie verskynsel, nl. 'n hoes as gevolg van 'n vreemde voorwerp in die uitwendige oorkanaal, word gegee deur Ballenger wat dit beskryf as 'n 'reflex ear cough'. Die posterior wand van die uitwendige oorkanaal word voorsien deur die auriculêre tak van nervus Vagus; enige vreemde voorwerp in of instrumentasie van hierdie gebied stimuleer die Vagus en die hoes-reflex word opgewek.

Opsomming. 'n Geval word beskryf van 'n pasiënt met 'n aanhoudende non-produktiewe hoes van vier jaar duur wat tenspyte van aanhoudende behandeling hardnekkig bly voortbestaan het. Ná deeglike ondersoek is 'n kraal in die regteruitwendige oorkanaal ontdek en verwyder met dramatiese opklaring van die hoes.

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EDITORIAL

LUNG ABSCESS

The fairly high incidence of lung abscess in this country is reflected in the papers published by authors from two different Provinces in this issue of the *Journal*. The frequency of the condition makes its diagnosis and treatment a matter of considerable importance to the practitioner, both physician and surgeon.

In past years the mortality rate has reached alarming figures. These have varied from 30% in treated cases to 70% in untreated cases.[1] Formerly even informed opinion on the subject was incomplete with the result that it was often difficult to decide whether, from the therapeutic point of view, a case should be treated medically or surgically. In the event, medical observation was often prolonged to such an extent that, when a further opinion was sought, the patient was beyond surgical aid. To-day, however, the duration and the limits of medical treatment as well as the indications for surgical intervention can be defined much more clearly. In addition, the newer antibiotics have been shown to play an important role in both types of treatment.

The numerous problems in the differential diagnosis of pulmonary suppuration are very fully illustrated in the papers published in this issue. One of the great difficulties is the distinction from bronchial carcinoma. Many reasons have been advanced for the increase in the incidence of this form of malignancy. The startling fact emerges that, at present, 10% of all deaths from all types of carcinoma is due to bronchial neoplasm.[2] It is rightly and repeatedly stressed that carcinoma must always be excluded in any adult patient suffering from a supposed lung abscess. In fact, the diagnosis may only be obtained on the operating table.

Amoebiasis, on the other hand, is common throughout South Africa, particularly in Natal, where it may be regarded as an endemic disease. Indeed, the presence of amoebic cysts in the stools with subsequent hepatic infection is encountered fairly commonly. As the infection may spread from the liver to involve the base of the right lung, amoebiasis must always be considered as a possible etiology of a lung abscess in

1. Glover and Clagett (1948): Surg. Gynec. Obstet., **86**, 385.
2. Ochsner, De Bakey and Dixon (1947): J. Amer. Med. Assoc., **135**, 321.

VAN DIE REDAKSIE

LONG-ABSES

Die taamlike hoë voorkomssyfer van long-abses in hierdie land word aangetoon in die verhandelinge wat deur skrywers van twee verskillende Provinsies in hierdie uitgawe van die *Tydskrif* gepubliseer word. Die feit dat hierdie siektetoestand so dikwels voorkom, maak die diagnose en behandeling daarvan 'n saak van aansienlike belang vir die geneesheer, beide internis en snykundige.

In die afgelope jare het die sterftesyfer ontstellende hoogtes bereik. Dit het gewissel van 30% in behandelde gevalle tot 70% in onbehandelde gevalle.[1] Voorheen was selfs gegronde kennis van die saak onvolledig met die gevolg dat dit dikwels moeilik was om te besluit of, vanuit die oogpunt van genesende behandeling, 'n geval medies of snykundig behandel moes word. By so 'n geval is die mediese waarneming dikwels in so 'n mate uitgereik dat, wanneer 'n verdere mening ingewin is, die pasiënt nie meer baat by snykundige hulp kon vind nie. Vandag egter kan die duur en beperkings van mediese behandeling sowel as die aanduidings vir die tyd wanneer 'n snykundige moet ingryp, duideliker omskryf word. Daarbenewens is aangetoon dat die nuwere kiemdodende middels 'n belangrike rol by albei soorte behandeling speel.

Die talryke probleme van onderskeidende diagnose by verswering van die long word ten volle aangetoon in die verhandelinge wat in hierdie uitgawe gepubliseer word. Een van die grootste moeilikhede is om dit te onderskei van karsinoom van die lugpyp. Baie redes is al aangevoer vir die toename van hierdie vorm van kwaadaardigheid. Die ontstellende feit kom aan die lig dat 10% van die totale sterfgevalle weens karsinoom op die oomblik te wyte is aan gewasse van die lugpyp.[2] Dit word met reg en herhaaldelik beklemtoon dat karsinoom altyd eers uitgeskakel moet word by die diagnose van enige volwasse pasiënt wat vermoedelik aan 'n long-abses lei. Om die waarheid te sê, die diagnose mag eers op die operasietafel verkry word.

Amebiase daarenteen is dwarsdeur Suid-Afrika algemeen, veral in Natal waar dit as 'n endemiese siekte beskou kan word. Die aanwesigheid van amebiese siste in ontlastings met daaropvolgende besmetting van die lewer word taamlik dikwels teengekom. Aangesien die besmetting van die lewer kan sprei en die onderkant van die regterlong kan aantas, moet amebiase altyd as 'n moontlike oorsaak van 'n long-abses in die onderste deel van die regterlong in aanmerking geneem word.

1. Glover en Clagett (1948): *Surg. Gynec. Obstet.*, **86**, 385.
2. Ochsner, De Bakey en Dixon (1947): *J. Amer. Med. Assoc.*, **135**, 321.

the lower part of the right lung. Adequate and full investigation after the initial medical treatment cannot be emphasized too strongly. It is only if this programme is followed that the late sequelae from residual lung damage can be avoided.

An important and essential procedure before the discharge of a patient is a bronchographic examination. It is most inadvisable to omit this step and shortage of hospital accommodation certainly cannot and should not be cited as an excuse for failure to perform it. Incompletely healed abscesses result in recurrent infections which, in turn, usually necessitate frequent re-admissions to hospital. The same pattern of events, producing chronic ill health, leads also to considerable absenteeism in industry. All these regrettable and preventable complications can be anticipated only by suitable treatment adequately performed.

The high standard of modern medicine in the treatment of lung abscess has produced a considerable drop in mortality and invalidism in this disease. This demonstrates how much can be achieved by physician and surgeon collaborating in the use of modern medical and surgical methods of treatment. This team work finds one of its most rewarding opportunities in the management of pulmonary suppuration.

Genoegsame en volledige ondersoek, na die aanvanklike behandeling, kan nie genoeg beklemtoon word nie. Dit is slegs wanneer hierdie skema gevolg word dat die latere gevolge van oorgeblewe beskadiging van die longe voorkom kan word.

'n Belangrike en noodsaaklike handeling voordat die pasiënt ontslaan word, is 'n bronchografiese ondersoek. Versuim om hierdie stap te doen is uiters onraadsaam en 'n tekort aan hospitaalakkommodasie kan en behoort sekerlik nie as verskoning te dien vir versuim om dit te doen nie. Absesse wat nie volledig genees het nie, het besmettings tot gevolg wat op hulle beurt die herhaalde toelating van die pasiënt tot die hospitaal noodsaak. Dieselfde reeks gebeurtenisse wat tot kroniese ongesondheid lei, het ook aansienlike afwesigheid by die nywerheid tot gevolg. Al hierdie betreurenswaardige en verhoedbare komplikasies kan slegs voorkom word deur geskikte behandeling wat toereikend toegedien word.

Die hoë peil van moderne geneeskunde by die behandeling van abses van die long, het 'n aansienlike vermindering van die sterfte- en ongeskiktheidsyfer by hierdie siekte veroorsaak. Dit toon aan hoeveel bereik kan word deur internis en snykundige wat saamwerk by die aanwending van moderne mediese en snykundige behandelingsmetodes. Die behandeling van longverswerings bied een van die belonendste geleenthede vir hierdie spanwerk.

SUPPURATIVE DISEASE OF THE LUNGS IN THE BANTU

SURGICAL ASPECTS

G. R. CRAWSHAW, F.R.C.S.
and
L. FATTI, F.R.C.S.
Department of Surgery, University of the Witwatersrand and the Thoracic Surgical Unit, Baragwanath Hospital, Johannesburg

A recent 12-month period at Baragwanath Hospital produced, out of over 24,000 in-patients, more than 150 cases of suppurative disease of the lung parenchyma. This communication is an attempt to show the application of modern surgical methods to some of these cases, to point out some of the peculiar difficulties encountered and the lessons learnt from them. It is not intended to be a statistical study for we are, as yet, unable to provide adequate information about what happens to the patients after they leave hospital.

We have been fortunate in having the co-operation of an able group of physicians working with us as a team. What success has been achieved is in no small part due to this fundamental requirement and general appreciation of the fact that the best results will be obtained when physician and thoracic surgeon work in close co-operation from the onset of the disease.

HISTORICAL SUMMARY OF THE TREATMENT OF LUNG ABSCESS

Before 1938 the treatment of 'uncomplicated' lung abscess was left largely in the hands of the physician. The mortality rate with conservative measures was variously estimated to be between 30% and 70%, while many of the survivors became chronic invalids. Growing knowledge of the natural history, pathology and anatomy of the disease, together with advances in thoracic surgical technique, ushered in an era of treatment by bronchoscopic and external drainage supplementing medical measures. These adjunctive methods, however, tended to be delayed in application and it was left to Neuhof [1] in 1938 to stress the importance of early co-operation between surgeon and physician and to show that, when the disease was regarded as surgical from the start, the immediate mortality could be reduced to 5% of cases, or less.

The appearance of potent chemotherapeutic and antibiotic remedies tended to nullify this important advance, because it was found that, with their aid alone, symptomatic cure of a lung abscess very frequently occurred. Many observers came to realize that such symptomatic cure was commonly merely the expression of sterilization of a persisting cavity in a distorted, fibrotic, ill-functioning pulmonary segment which, sooner or later, became re-infected or initiated bronchiectatic changes in surrounding tissue. Nevertheless, it is only recently that the operation of lobectomy by dissection, practised widely since 1941 and in the development of which improved anaesthetic methods played a large part, has been applied to the treatment of these cases.

The present position is that a lung abscess is a matter for co-operation between surgeon and physician from the beginning of treatment. The surgeon may be called upon:—

1. To perform bronchoscopy.
2. To provide external drainage.
3. To excise diseased pulmonary segments.
4. To deal with complications, viz. haemorrhage, empyema, cerebral abscess.

MATERIAL

Seventy-three consecutive cases of lung abscess with or without adjacent localized bronchiectasis have been taken for study. Of these 58 were males and two-thirds of the patients were between the ages of 20 and 40 years. The loss of working time, chronic invalidism and economic distress represented by these cases are difficult to estimate; but suffice it to say that the usual length of history obtained is measured in years, not months, with repeated episodes of acute illness. This fact reflects the present disinclination of the non-European patient to accept radical treatment, particularly surgical treatment, and his decided preference for running repairs through the agency of antibiotics and chemotherapeutic remedies with transient symptomatic relief. His memory for past significant illness is short and one may easily be misled by a story of four or five days' illness coming out of the blue with cough, pain, foul sputum and fever until patient questioning elicits a story of one or more similar incidents months or years earlier.

Clubbing of the fingers and heavy mediastinal shadows in the X-ray picture often give a clue to chronicity. There can be no sharp line drawn between an acute lung abscess and a chronic one. We take the view that an abscess cavity which persists after eight weeks of sustained chemotherapy and postural and bronchoscopic drainage is not going to heal without permanent structural damage to surrounding lung tissue and, other things being equal, is an indication for radical surgery. This particularly applies in the case of the multilocular abscess cavity. Continuing investigations and wider experience may lead us to revise, modify or extend the indications for operation.

In this series 66 therapeutic and diagnostic bronchoscopies were performed, four abscesses were drained externally and 13 resections were done. Nine patients refused any form of surgical treatment and five were considered unfit for major surgery because of gross toxaemia, renal failure or cardio-vascular disease.

METHODS

1. *Postural Drainage and Chemotherapy.* We treat an acute lung abscess or a chronic lung abscess, with re-infection and an exacerbation of symptoms and signs, by the institution of the appropriate postural manoeuvres and the administration of antibiotic and chemotherapeutic remedies. The postural drainage more often than not is effective in these cases. Pain which may inhibit coughing should be relieved by morphine given 20 minutes before posturing and the patient must then be vigorously encouraged to bring up his sputum. Both nursing staff and physiotherapist play their parts in the regimen, which must be thorough to be effective. The dosage of penicillin used is one mega-unit *per diem* given in 3-hourly, 6-hourly or 12-hourly injections. Using aqueous solutions we have as yet been unable to demonstrate any advantage in the more frequent injections, but this requires further study. The use of sulphonamides is not often indicated and they are only given when there is doubt about the response to penicillin. Sulphadiazine is the drug of choice and must be given 4-hourly in 1-gramme doses. It must be emphasized that failure of the symptoms and signs to remit with conservative measures is much more likely to be due to ineffective mechanical drainage than to an organism insensitive to one or other drug. In the rare case of the presence of a penicillin-resistant organism or strain aureomycin, if available, would be the antibiotic of choice pending the result of sensitivity tests. The course of therapy in these cases lasts from five to 10 days, depending on the clinical response. After 10 days, and probably before, continuation with antibiotics is useless and, indeed, unwise since they may be better withheld and used later to cover a major surgical procedure.

2. *Bronchoscopic Drainage.* Failure to produce a free elimination of secretions within 24 hours of the institution of the methods of postural drainage calls for immediate bronchoscopy. The passage of the bronchoscope and the aspiration of secretions through it are frequently followed by continuing effective drainage through the removal of tenacious mucous plugs and the initiation of selective coughing due to local irritation of bronchi. Large sloughs from an abscess cavity may then be coughed up. One of our cases spontaneously expelled a huge slough, probably consisting of half the lower lobe, 12 hours after bronchoscopy, with dramatic relief of symptoms although the slough could not be removed at the time of operation because of its size.

Bronchoscopy is only an incident in the postural drainage and chemotherapeutic regime, however, and this must be continued after the patient's return to the ward. Bronchoscopy may be repeated as a therapeutic measure but we have found that a second bronchoscopy seldom succeeds where the first has failed and failure to secure drainage after one bronchoscopy usually indicates the need for more radical treatment.

Apart from its value in treatment of lung abscess, bronchoscopy may reveal the underlying cause of the

lesion. In this series we have removed one foreign body, diagnosed twice aneurysm of the aorta compressing the left main bronchus and once a carcinoma of the bronchus.

The method of anaesthesia used in most of our cases was that described by Fatti and Morton [2] using pentothal and preventing laryngeal spasm during introduction and withdrawal of the bronchoscope by making the patient breathe carbon dioxide (10%) in oxygen. In addition the larynx was sprayed with 2% amethocaine. The method is admirably suited to the Bantu patient where complete co-operation under local anaesthesia is difficult to obtain because of fear and language difficulties. Moreover the heavy, well-muscled mandible and bulky tongue of many of these young male patients makes the operation difficult, without the use of undue force, when muscular relaxation is lacking.

3. *External Drainage.* External drainage of a lung abscess is performed in one stage by rib resection, the removal of sloughs and the insertion of a gauze pack and soft rubber tube into the cavity. The method depends for its success on accurate localization of the abscess [3] and accurate timing. It is probably called for most frequently during the period from the third to the seventh week of the life history of an acute abscess, when it may result in the rapid healing of the cavity and a broncho-cutaneous fistula. A minority of acute abscesses responds to external drainage by acute spreading suppurative pneumonitis.

Its use in chronic lung abscess is restricted to the case where postural and bronchoscopic drainage have failed but the patient is unfit or unwilling to have a lobectomy or a pneumonectomy.

4. *Lobectomy and Pneumonectomy.* Resection of a lobe or a lung irreparably damaged by suppurative disease calls for close teamwork in choosing cases and in their pre-operative and post-operative care. Many of our patients have had their health undermined for many years by a chronic abscess and they offer a far different problem from the children with bronchiectasis, where resection of lung tissue is an operation of minor hazard with uniformly quick, smooth recovery. It is desirable, in these chronic lesions in the Bantu, to choose for resection a fit patient whose disease is suitable.

Is the Disease Suitable for Resection? Cavitation in the lung due to an abscess may simulate tuberculosis, especially if the foetor of the sputum has diminished or disappeared after penicillin therapy. The sputum must therefore be six times negative for the tubercle bacillus on direct and cultural examination and this must also be confirmed by a negative bronchial swab.

Bronchoscopy must be carried out to eliminate foreign bodies, carcinoma and aneurysm.

Resection cannot be undertaken if there is gross bilateral disease in the lungs and so complete visualization of the bronchial tree by bronchography is a *sine qua non.* Anything more than a minor degree of contralateral bronchiectasis may leave the patient with a crippling loss of functioning lung tissue after pneumonectomy. It may be compatible with good function after lobectomy.

'Straight' radiographs of the chest may be of great value in assessing a case for operation. One of our colleagues, Dr. V. H. Wilson, has drawn attention to certain mediastinal shadows which seem to correlate with technical difficulties at operation due to gross adhesion of the lung to the structures of the mediastinum.

Is the Patient Fit for Operation? Fifty years is probably the upper age limit for resection in the Bantu. Vital capacity and exercise tolerance should be within normal limits and the diastolic blood-pressure not greater than 90 mm. Hg. There must be no evidence of renal failure. Amyloid disease is not uncommon in these cases. Therefore we must have a chemically normal urine and if the ability to concentrate up to 1025 is in doubt, the blood urea level and urea clearance test must give normal figures.

Pre-operative Treatment. When a case has been accepted for resection there is a period, during which lipiodol in the bronchial tree is slowly disappearing, which is used to bring the patient into his best condition for operaton. We institute physical training in the form of medicine ball, breathing and rhythmic exercises to improve his vital capacity. Postural drainage is continued and occupational therapy of the patient's own choice is given. This waiting time is usually about six weeks and practice of deep breathing induces subconscious motivation and is carried over into the post-operative period when adequate ventilation and a lively cough are all-important.

The patient awaiting operation is given a full hospital diet supplemented by vitamin C (1 G. daily for two days before the operation and five days after it). Anaemia is corrected and a plasma protein level of 6.5 G.% should be established. We commonly find a reversed albumin-globulin ratio in these patients, but we have not met with any success in our efforts to correct this. On the other hand, severe transfusion reactions do not seem to have been more common in these people than in those with a normal ratio.

OPERATIVE TECHNIQUE

The operation is dissection lobectomy or pneumonectomy. Pleural adhesions and mediastinal fibrosis, often of fearsome nature, have been met and it is inevitable that there is a considerable degree of shock due to blood loss and neurogenic factors. We have found that it is invaluable to have two intravenous infusions going, one of whole blood and the other used by the anaesthetist for procaine therapy and available for more blood if necessary. One of our cases (No. 7930) without doubt owes his life to this measure as we were able to replace blood very rapidly at a crucial point of the operation when there was torrential haemorrhage from a pulmonary vein.

The dosage of procaine used intravenously has been varied. Usually about one gramme in a 1 : 1000 solution has been given over 1½-2 hours by the drip method. We believe that shock of neurogenic origin and cardiac irregularities may be reduced in this way. Certainly it is of value in abolishing spasm in the veins used for the drip infusions. This removes the possibility of tragedy in an unresponsive 'drip' should there be sudden sharp blood loss. The dose of procaine used is well under that which may produce cyanosis and convulsive phenomena.

Controlled respiration anaesthesia is used and the patient postured in the head-down position to encourage the gravitation of secretions towards the pharynx where they are innocuous and easily dealt with. After lobectomy the remaining lobes

are inflated before closing the chest and an intercostal drain is inserted through a separate stab incision. The patient is coughing and rapidly recovering consciousness before he is allowed to leave the table.

Post-operative Treatment. The encouragement of deep breathing and coughing is the most important single item of post-operative care since it prevents the accumulation of secretions in the major bronchi with consequent hypo-ventilation and inadequate expansion of the remaining lobes. Futhermore, expulsion of air and fluid via the intercostal drain is facilitated during the half-hour in every 12 that the drain is open, under water-seal, in a bottle at the bedside. In order to render this coughing painless during the first 48 hours we give morphine as required. This is the best drug provided that the patient is actively supervised and continually made to cough during the analgesic period. The intercostal drain remains in the chest for 48 to 72 hours, as a rule, after which either the lobe is completely expanded or any remaining effusion can be dealt with by aspiration. Constant clinical observation during this period enables one to recognize mediastinal shift due to a large effusion and this is an indication to open the underwater drain until the balance is redressed. Atelectasis of remaining lobes is difficult to recognize radiologically in the immediate post-operative period because of the veiling of the whole hemithorax and the fact that the mediastinum may be central or shifted away from the side of the atelectatic lobe owing to the accompanying effusion. In cases of doubt where air entry is diminished or absent, in spite of an efficient intercostal drain, bronchoscopy should be performed immediately. It is of much less value when atelectasis has been established more than 12 hours, since retained secretions are by this time in the smaller bronchioles and inaccessible to bronchoscopic suction.

The hemithorax should be aspirated as dry as possible on the eighth day in pneumonectomy cases, leaving atmospheric pressure, lest a suddenly occurring bronchopleural fistula expose the patient to the risk of drowning or an overwhelming bronchopneumonia.

5. *Treatment of Complications*: *Haemorrhage.* Haemoptysis from a lung abscess is occasionally exsanguinating. Transfusion of whole blood is obviously indicated but it is sometimes inadequate alone. The decision to perform lobectomy as an emergency measure is not easily taken as the patient is suffering from an acute spreading infection with toxaemia. In two such cases we have successfully employed phrenic crush.

Empyema. The rupture of a lung abscess into free pleura occurs not infrequently in our practice. Drainage by rib resection must often be resorted to before the pleura is thick and in the presence of a mobile mediastinum because the patient is going downhill and closed drainage is ineffective. Provided that the operation is performed under local anaesthesia and with due care, the course of recovery is remarkably rapid and smooth with complete healing of the wound and obliteration of the bronchopleural fistula.

RESULTS

Table I summarizes the methods of treatment used and the results obtained in 73 consecutive cases of lung abscess in the Bantu. Under the heading 'Cured' we have included only those patients whose disease had been eradicated on discharge from hospital as proved by the absence of symptoms and normal bronchographic appearances. The patients 'Greatly Improved' were all without symptoms on discharge, 20 had normal radiographic appearances, four had residual cavities on bronchography but refused operation. None has relapsed, to our knowledge. Although our follow-up is inadequate we feel that some of these patients may well be cured and the figure under 'Cured' is probably considerably lower than the fact. We are so situated that it is likely that a patient who experienced a recurrence of symptoms would come back to the hospital as did, in fact, four of the six patients 'Still Ill, though Improved'. Periods between 16 months and five months since discharge from hospital have elapsed in the cases of our 'Greatly Improved' patients.

Postural Drainage and Chemotherapy with or without Bronchoscopic Drainage. Table II summarizing 56 cases of lung abscess is a break-down of the first column in Table I. It shows the frequency with which

TABLE I: SUMMARY OF THE METHODS OF TREATMENT USED AND THE RESULTS OBTAINED IN 73 CONSECUTIVE CASES OF LUNG ABSCESS IN THE BANTU

	Postural Drainage and Chemotherapy, with or without Bronchoscopic Drainage	*Resection*	*External Drainage*	*Total*
Number of patients	56	13	4	73
Death: In Hospital	3	2	3	8
Death: Late	0	1	0	1
Cured	12	8	0	20
Greatly Improved	35	1	1	37
Still Ill, though Improved	6 (Refused to accept bronchoscopy)	0	0	6
Still in Hospital	0	1	0	1

TABLE II : SUMMARY OF THE RESULTS OF TREATMENT OF 56 CASES OF LUNG ABSCESS BY MEANS OF POSTURAL DRAINAGE AND CHEMOTHERAPY, WITH OR WITHOUT BRONCHOSCOPIC DRAINAGE

	Postural Drainage and Chemotherapy Alone	*Postural Drainage and Chemotherapy with :*			*Total*
		Bronchoscopy Once	*Bronchoscopy Twice*	*Bronchoscopy Thrice*	
Cases	21 (Includes nine who refused bronchoscopy)	25	8	2	56
Deaths	2	1 (Ruptured aortic aneurysm)	0	0	3
Cured	4	7	1	0	12
Greatly Improved	9	17	7	2	35
Still Ill, though Improved ...	6	0	0	0	6
	Only cases in which surgical advice was sought are included in the above table.				

TABLE III : SUMMARY OF 13 CASES OF LUNG ABSCESS IN WHICH RESECTION OF LOBE OR LUNG WAS CARRIED OUT

Case No.	*Age*	*Sex*	*Site of Disease**	*Length of History*	*Operation*	*Complications*	*Result*	*Remarks*
4690	21	M	(R) U & L	6 years	Pneumonectomy	Haemorrhage	Died	Radiological 'widening of upper mediastinum on right'. Very fibrous.
2460	11	M	(L) U	5 months	Lobectomy	—	Cured	Easy dissection.
17868	36	M	(R) M & L	2 years	Lobectomy	Empyema B.P.F.*	Cured	Very fibrous mediastinum. Empyema treated by rib resection.
7930	37	M	(L) L	2 months	Lobectomy	Empyema	Cured	Empyema treated by rib resection.
22154	26	M	(L) L	4 months	Lobectomy	—	Cured	—
13373	18	M	(R) M	3 months	Lobectomy	Empyema	Cured	Empyema treated by aspiration and penicillin replacement.
10525	4	M	(L) L	Unknown	Lobectomy	—	Cured	—
1876	21	M	(L) L	6 months	Lobectomy	—	Greatly improved	Subjectively cured. Has residual bronchiectasis (R) L lobe.
10003	28	M	(R) U & L	1 year	Pneumonectomy	B.P.F.*	Died	Very dense fibrosis. Stump of bronchus difficult to close.
16469	30	M	(L) L	2 years	Lobectomy	—	Cured	—
145	26	M	(R) L	4 years	Lobectomy	Haemorrhage	Died	Gross mediastinal fibrosis and adherent lung.
17112	40	M	(L) U & L	3 months	Pneumonectomy	—	Cured	—
31709	34	M	(R) L	4 months	Lobectomy	Empyema	Still in hospital	Empyema treated by decortication.

* (L) and (R) refer to the right or left lungs.
L, M, U refer to the lower, middle or upper lobes.
B.P.F. means bronchopleural fistula.

TABLE IV : SUMMARY OF FOUR CASES OF LUNG ABSCESS IN WHICH EXTERNAL DRAINAGE WAS APPLIED, MORE CONSERVATIVE MEASURES HAVING FAILED

Case No.	*Age*	*Sex*	*Site of Disease*	*Length of History*	*Result*	*Comment*
287	38	M	(R) L	2 years	Died	Death due to haemorrhage from the abscess cavity. Gross fibrosis, pulmonary and extrapulmonary. Unfit for resection.
285	35	M	(R) M	Unknown	Died	Sudden death, with hyperpyrexia and coma preceding it, three weeks after drainage. Autopsy refused.
3494	28	M	(R) L	3 years	Improved	An epileptic (idiopathic grand mal). Radiologically has gross mediastinal widening. Has a persistent bronchial fistula.
19585	50	M	(R) U	'Many years'	Died	Refused lobectomy one year before he died. Death due to suppurative bronchopneumonia on the left two days after drainage.

bronchoscopic drainage was employed and that a single operation is all that is usually required to instigate adequate drainage. Second and third bronchoscopies are not often called for nor are they as successful as the first.

Resection. Thirteen cases of lung abscess in which resection of lung tissue was undertaken are set out in Table III (Fig. 1). The patients were all males. The operation was lobectomy in 10 cases and pneumonectomy in three. Three patients are dead, two having died in the immediate post-operative period due to excessive blood loss after long and difficult hilar dissection. Gross mediastinal fibrosis and dense pleural adhesions are an outstanding hazard in these cases and reflect the chronic nature of the lesions. They make the operation itself a long one, ligatures do not bite well, blood loss is increased, the bronchial stump cannot easily be cleaned and nicely closed and pleural cover for the stump is difficult or impossible to find. The third death in the series occurred six months after the operation in which bronchial closure had been difficult and a persistent bronchopleural fistula led eventually to a suppurative bronchopneumonia. Non-fatal complications occurred in four cases, one of which is still under treatment. All these men had empyema following operation. Two were treated by rib resection, one by aspiration and penicillin replacement and one by decortication. It is the last mentioned who remains in hospital with a small residual sinus. A bronchopleural fistula was demonstrated in one of the cases submitted to rib resection but healed spontaneously. Two of the four complicated cases were noted to be very difficult technically on account of dense mediastinal fibrosis.

Fig. 1. Cut surface of lung showing thick-walled cavity of a chronic abscess with surrounding bronchiectasis: the type of lesion that can only be treated by resection.

Of the nine cases discharged from hospital eight are perfectly well and true cures for periods ranging from 12 months to five months. The other patient discharged has a minimal basal bronchiectasis on the side opposite his lobectomy. This does not incommode him and he is greatly improved by his operation.

The age of the patient has not seemed to be an important factor. A child of four (lobectomy) and a man of 40 years (pneumonectomy) in the series stand out as having had strikingly smooth, quick convalescence. Nor does the extent of the diseased tissue removed seem very important. Indeed pneumonectomy may be easier than lobectomy when this peculiar, gross, dense mediastinal fibrosis is present, since the pulmonary vessels and the bronchus can then be approached through the pericardium.

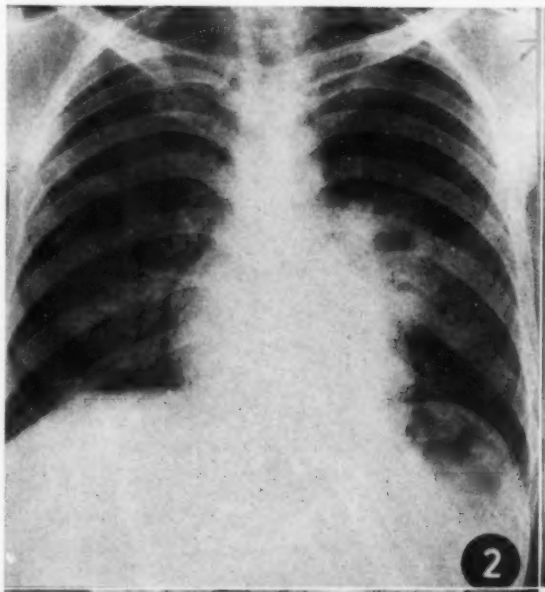
It is interesting to speculate on a possible connection between the excessive fibrosis occurring in the hilar region in chronic pulmonary suppuration in the Bantu and his tendency to keloid formation in scar tissue. There seems little doubt that dense hilar fibrosis may develop in as short a time as three months in these patients. Admittedly, as we have noted, histories are not easily verified owing to language difficulties, a relatively high threshold for pain and discomfort and a short memory for previous ill-health.

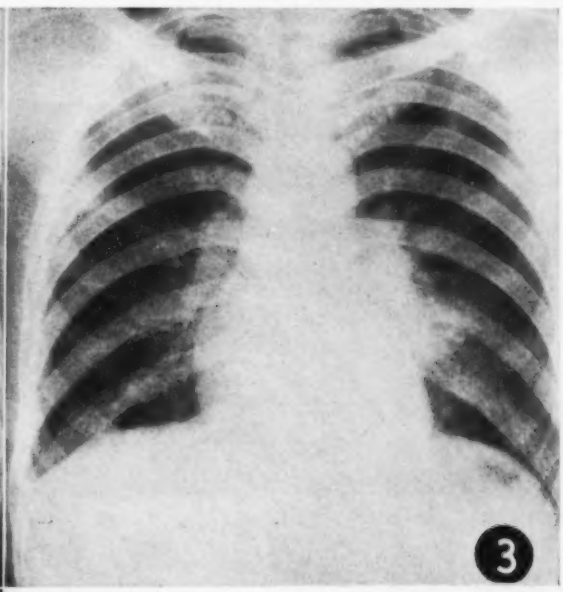
External Drainage. Four cases of lung abscess were drained externally and are summarized in Table IV. These cases were not suitable for resection and although, as we have said, external drainage is generally applicable for only a very short period in the early life of a lung abscess, it was the only method available for these desperately ill patients in whom postural and bronchoscopic drainage was ineffective. They all suffered chronic lesions with re-infection.

The cause of death was haemorrhage from the abscess cavity in one, septic bronchopneumonia in one and unknown in the third. The survivor has a persistent bronchocutaneous fistula after 11 months.

CONCLUSIONS

We find that lung abscess is a common disease in the Bantu, and responsible for much chronic ill-health and social and economic distress. Modern surgical methods of treatment applied early in the course of the disease are successful but surgery tends to be late because the patient comes late to hospital, having put up with a lot of pain and discomfort, and prefers to accept 'running repairs' in the form of antibiotic and chemotherapeutic remedies with symptomatic and transient relief.





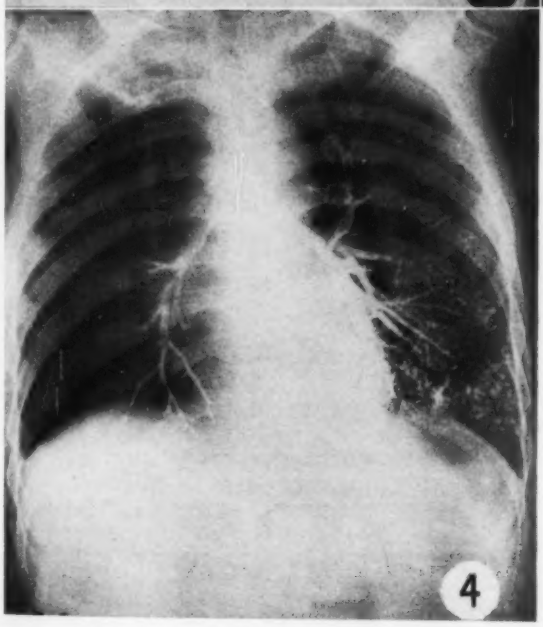


Fig. 2. Cavitation in the midzone (actually apical and subapical segments of the lower lobe) of the left lung, with fluid levels, due to lung abscesses. Before treatment.
Fig. 3. The same patient as in Fig. 2 after treatment by postural drainage and antibiotics with symptomatic cure. The abscess cavities are apparently gone.
Fig. 4. The same patient as in Fig. 3 and on the same day. Lipiodol has filled an abscess cavity in the left lower lobe. The outline is somewhat obscured by the heart shadow.

The chronicity of the lesions which come to radical surgery is, as yet, great and introduces technical difficulties which make this series noteworthy. Late surgery in these cases is hazardous because of gross mediastinal fibrosis and poor general condition. The presence of a cavity in the lung after the symptomatic cure of a lung abscess means to us the presence of irreversible tissue damage which, sooner or later, will operate to deplete the vital reserves of the body. That these cavities are often not demonstrable in plain radiographs of the chest is unfortunate, for it may instil a false sense of security and blind one to the necessity for bronchographic studies of the whole bronchial tree (Figs. 2, 3, 4, 5, 6). A residual cavity, however small, after two months of zealous treatment, should be removed by lobectomy, complete or segmental.

It would appear that, in the Bantu particularly, there is seldom an indication for external drainage of a lung abscess. The lesion either responds well to postural drainage and chemotherapy, with or without bronchoscopic drainage, or else resection is the treatment of choice.

This development in the evolution of the treatment of the disease is due to two factors, improved and potent antibiotic and chemotherapeutic remedies and the application of bronchoscopic drainage at an early stage in the disease. It would be unwise to forecast the disappearance of the method of external drainage, however, for it may be that there is, at present, a tendency to overtreat the acute, unilocular abscess with antibiotics and then resect the lobe when it is obvious that conservative measures have failed. There is probably a number of simple abscesses in this category which would heal completely if drained externally during the period from the third to the seventh or eighth weeks of their development. Recent American writing[4] reflects a tendency to drop the method of external drainage of lung abscess.

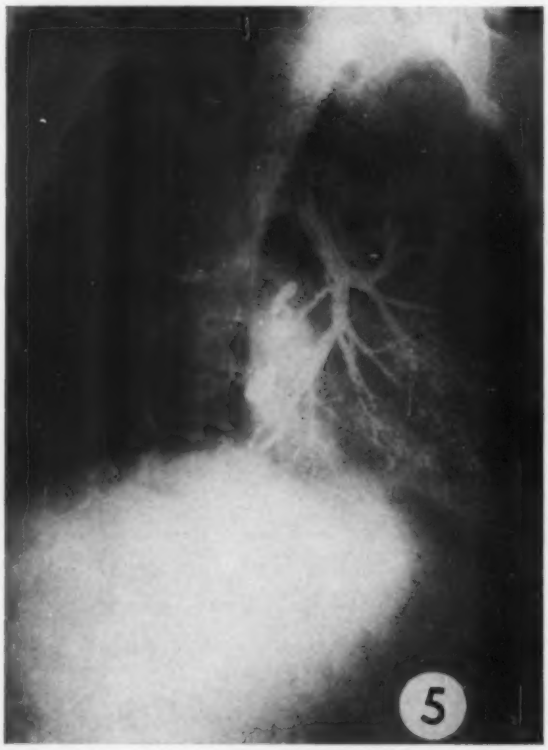


Fig. 5. An oblique view of the same subject as Fig. 4. There now appear at least two abscess cavities in the apical and subapical segments of the left lower lobe and there is bronchiectatic change in the posterior basic bronchial system.

Fig. 6. The lateral view of the same subject as Fig. 5. There is a multilocular system of abscesses in the left lower lobe. Case 7930, treated by lobectomy.

SUMMARY

In a 12-month period 73 cases of lung abscess in non-European patients were treated. The method of treatment was postural drainage and chemotherapy, with or without bronchoscopic drainage, in 56 cases; external drainage in four cases and resection in 13 cases. Eight patients died.

The methods of treatment are described. Emphasis is laid on the need for consultation between physician and surgeon from the start of the illness.

The chronicity of the lesions coming to surgery is pointed out and the technical difficulties due to excessive fibrosis are noted.

It is suggested that the persistence of a cavity in the lung after symptomatic cure of a lung abscess is a serious latent menace to health.

Routine bronchographic studies are recommended.

A residual cavity, however small, after two months of zealous treatment, should be excised.

The infrequency of an indication for external drainage of a lung abscess is attributed to improved and potent antibiotic remedies and the application of bronchoscopic drainage at an early stage in the disease.

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LUNG ABSCESS

W. L. PHILLIPS, F.R.C.S. (ENG.), M.R.C.P. (LOND.)

Cape Town

The treatment of lung abscess is not as standardized as the treatment of other inflammatory processes. The introduction of new anti-bacterial preparations is partly responsible for the changing views of the treatment of lung abscesses, while the improvement in surgical technique has prompted us to revise our ideas of the surgical approach to this condition.

In the past several different classifications of lung abscesses were employed. Some observers classified them by virtue of their acuteness or chronicity, whilst a more realistic approach classified them into groups requiring medical or surgical treatment. At one time lung abscesses were separated into groups of tuberculous and non-tuberculous or pyogenic abscesses; and yet another classification divided them into putrid and non-putrid types.

These different classifications led to a great deal of confusion, making it unnecessarily difficult, not only for practitioners seeking guidance in the treatment of these patients, but also for those engaged in the teaching of students.

The purpose of this paper is to present a full and critical review, based on a series of cases treated by the author.

Age Incidence. Lung abscesses may occur at any age, but generally they occur during the adult period of life. They are not commonly seen in infancy and youth.

Sex Distribution. Few female patients figure in the cases reviewed. This is probably not merely coincidental, as other observers have remarked on the comparative infrequency of women suffering from lung abscesses, due to non-tuberculous causes. On the other hand, abscess cavity formation due to tuberculosis is seen equally often in both sexes.

Distribution of Abscesses. As a rule, an abscess is only found in one lung, though not infrequently abscesses are seen in both lungs, and quite often more than one abscess may be present in a particular lobe. Occasionally several abscesses occur, due to non-tuberculous causes. The presence of multiple abscesses strongly suggests tuberculosis as the cause of the disease process.

Two sites are most commonly affected in the non-tuberculous cases.

i. The dorsal division or apex of the lower lobe, particularly on the right side, which American authors call the superior segment of the lower lobe.

ii. The upper lobe on the right side is frequently involved.

Reference to the distribution of the bronchi must be made to explain why these areas are chosen as sites of election by this disease. The upper lobe bronchus on the right side is the most proximally dependent part when a patient is lying flat on his back. This position is the one most likely to be adopted in the unconscious state following on injury, or a drunken bout.

On the other hand, the most dependent site when asleep in a bed, with the head propped up on pillows, is the dorsal division of the lower lobe. The frequency with which this site is affected in tuberculous and non-tuberculous lung abscesses, points strongly to the effect of gravity.

ETIOLOGY

Abscess formation may be initiated via the bronchi, the blood stream, direct implantation, or by degeneration or necrosis within the lung.

(a) *Inhalation or Aspiration of Noxious Material.* Inhalation or aspiration of noxious material is probably the most common exciting cause of lung abscess. Food, pus, blood, infected material from a carious tooth, or from a tonsil, or foreign bodies such as peanuts, may enter the bronchi. Unless careful precautions are taken during anaesthesia and in the immediate post-anaesthetic period, there is always a possibility of material entering the lungs. Generally, substances which are aspirated into the lungs reach the lower lobe and lodge in the dorsal division. This localization is purely gravitational.

Partly digested food may be aspirated into the lung following accidents with concomitant unconsciousness and vomiting. If the unconsciousness is due to drunkenness, and the patient has been lying with head dependent, the stomach contents may be aspirated into the upper lobes. This is most frequently seen in African and Coloured cases admitted to the hospitals in South Africa.

The frequent occurrence of lung abscess in the lower lobes of patients who have not had surgical treatment of the upper respiratory passages, has raised the question of another source of the infected, aspirated material. The number of patients with lung abscesses, associated with severe dental caries, suggests that grossly infected material may be inhaled into the lung during sleep.

Inhalation of insects, such as the house fly, can cause inflammation and suppuration in the lung.

The inhalation or aspiration of bacteria as the cause of lung abscesses requires further discussion. When the sulpha group of drugs was first introduced, numerous cases of lung abscess were seen following on the treatment of 'influenza' with these preparations. Sulpha drugs were prescribed for patients as soon as they developed an 'attack of influenza'. These cases invariably failed to respond to treatment, but the increased occurrence of lung abscesses and empyemata suggested that something had happened to the patient. The complications occurred some time after treatment was discontinued, many of these patients showing a depression of the leucocyte counts, which suggests that the lung had become a suitable nidus for an invasion by secondary infecting organisms.

Without doubt, the inhalation of tubercle bacilli will cause a tuberculous infection and abscess formation. It is evident, therefore, that the inhalation of infecting organisms is of importance as a cause of lung abscess.

(b) The possibility that *infected emboli* may reach

the lung and lead to abscess formation must not be overlooked. Some of the cases reported show the presence of a local abscess in the forearm, followed dramatically by multiple abscesses in the lung.

Boils and other superficial skin conditions are common, and if an infected embolus gains access to the blood stream, it is most likely to be filtered out in the lung. Tissue resistance must normally be very high, as infected emboli must frequently enter the blood stream, and yet the incidence of lung abscess remains relatively low. The combination of aspiration of infected material from the teeth during sleep, plus the possibility of infected emboli reaching the lungs must be regarded as likely causes of the so-called lung abscess of uncertain etiology.

Case 1. Mr. de K., a farmer aged 43 years, complained of cough, foul sputum which was occasionally blood-stained, and loss of weight. He had had some carious teeth extracted, and had several boils on his arms. The specialist physician who saw him suspected a metastatic lung abscess (Fig. 1).

Special Investigations. The leucocyte count was 11,800 per c.mm., mostly polymorphonuclear leucocytes.

The sputum contained a mixture of bacteria.

The chest radiograph showed an area of segmental collapse in the upper lobe of the left lung.

The question of a bronchial carcinoma could not be excluded.

On admission to the Chest Unit a bronchoscopy showed foul mucopus issuing from the upper lobe bronchus, but nothing else could be discovered.

Operation. An exploratory thoracotomy showed the presence of a large firm mass extending from the periphery in, towards the lung hilum. The upper and lower lobes were firmly attached. A pneumonectomy was performed.

Macroscopic examination of the specimen showed a firm, indurated area in the lung in which central necrosis had taken place.

Histological Appearances. Chronic lung abscess.

Comment. It was impossible to state the etiology of the lesion at operation. The wisest method was to treat it as a carcinoma.

(c) *Complete obstruction of a bronchus* is frequently complicated by abscess formation in the more peripheral part of the lung, the most common cause of this being bronchial carcinoma. Frequently these carcinomata are small and in a relatively early stage, and the patient may only consult his doctor because of the symptoms of lung abscess. It is fortunate for the patient if such a carcinoma, which is usually asymptomatic, suddenly causes an obstruction to the bronchus, as he will then seek medical advice (Fig. 2).

Case 2. Mr. van R., a solicitor aged 57 years, complained of cough, purulent sputum, and pyrexia of six weeks' duration. A diagnosis of atypical pneumonia was made, and he was given penicillin and sulphadiazine. The temperature became normal and the chest signs cleared after 10 days. After a few days the temperature recurred, varying from 97.6° to 102° F. Physical signs appeared in the left subclavicular region. The temperature and signs again cleared, and returned once more without any treatment.

Radiographic appearances showed an irregular shadow in the left mid-zone extending from hilum to periphery. Subsequent films showed breaking down in the centre of the lesion. The diagnosis was carcinoma or lung abscess.

A blood count showed no unusual features.

The sputum showed no definite characteristics.

Bronchoscopy detected foul-smelling pus issuing from the bronchus of the upper lobe of the left lung. Nil else was discovered.

Operation. At exploratory thoracotomy, the lung was found firmly adherent to the chest wall. A large firm mass was palpated in the upper lobe. As the diagnosis was uncertain, the entire lung was removed.

Macroscopic examination of the specimen revealed a large abscess.

Histological examination showed the presence of a squamous-celled carcinoma.

(d) A large *carcinoma may undergo necrosis*, and here again, the supervening infection with abscess formation may be the first alarm signals.

(e) *Penetrating wounds of the chest* may be complicated by the formation of a lung abscess, and may be a result of the direct implantation of infected material in the lung parenchyma. Lung abscesses, complicating penetrating gunshot wounds of the chest, have been found to contain a variety of foreign material, such as clothing and pieces of wood.

(f) *Suppuration may extend* from the liver through the diaphragm, and present as a lung abscess. This sequence of events is not uncommon in amoebic abscess of the liver. Amoebiasis is common in many parts of the world, and as an amoebic abscess frequently involves the basal zone of the lung, this possibility must be kept in mind.

(g) Many cases are seen where *the lung abscess is a complication of some pre-existing disease.* Bronchiectasis may be complicated by the formation of a lung abscess. A hydatid cyst which ruptures into a bronchus may be converted into a large lung abscess if infection takes place. A careful history should help to exclude, what may be referred to as a primary lung abscess, from that which is secondary to some underlying pathological state (Figs 3a, 3b).

Case 3. Mrs. B., a housewife, was admitted to the City Infectious Fever Hospital, with scarlet fever. During recovery, she developed a slight cough with some sputum. Radiography of her chest showed the presence of a large abscess area in the mid zone of the left lung. Bronchoscopy showed no visible abnormality.

Large doses of penicillin were given by injection, and subsequent films of her chest showed rapid resolution of the abscess area. She was subsequently discharged from the hospital. The chest radiographs were practically clear, leaving only a small residual shadowing in the left mid zone.

Bronchography showed the presence of early bronchiectasis of the upper lobe bronchi. No evidence of residual lung abscess could be seen. As the degree of bronchiectasis was very slight, this patient is being kept under observation. If any further signs of infection occur in the left lung, resection of the upper lobe will be advised.

Comment. It is impossible to state whether the bronchiectasis had occurred before or after the lung abscess. It is possible that it was a pre-existing condition, and that an abscess was formed round the bronchiectatic area, due to the scarlet fever infection.

THE PATHOLOGY OF LUNG ABSCESS

The changes which take place are those which normally occur when inflammation is present. Three stages can be recognized:—

(a) *Pneumonitis.* This is the early inflammatory state, the stage of invasion by the organisms. From this point, either resolution of the whole process may take place with a restoration to normal, or there is an advance of the disease to stage (b).

(b) *Abscess Formation.* The abscess proper is formed when liquefaction and pus formation have occurred. If the site is walled off, the pus collects under pressure, and eventually an external outlet must be found. This may happen through rupture of the abscess into a bronchus, or into the pleural cavity. When there is

rupture into a bronchus, either complete or partial drainage may be achieved, and the abscess may heal or pass on to a more chronic stage. Chronicity, as a rule, is a result of inadequate drainage.

(c) *Extension of the Abscess.* If the abscess fails to heal as a result of its spontaneous emptying, or because of inadequate drainage, the inflammatory process may extend and involve more lung tissue. The walls become more ragged, and blood vessels may be seen traversing the abscess cavity. It is from these vessels that bleeding often takes place. At this stage, healing of an incomplete kind may take place, and a residual bronchiectasis may be left after the disappearance of the abscess proper.

(d) *Gangrene of the Lung.* This stage of wide-spread necrosis of lung tissue occurs with severe infections, associated with a poor resistance. The abscess extends rapidly throughout the substance of the lung, eventually causing death of large pieces of tissue. These sloughs may be coughed up, or the patient may die, either from severe toxaemia or from a massive haemorrhage.

THE LOCATION OF THE ABSCESS

Gravity plays an important part in the localization of the disease process. Generally, the dorsal and basal regions of the lower lobes are the sites most commonly involved. Not infrequently, the upper lobe is the site of an abscess (Fig. 4).

If one accepts the theory of infected emboli, then lung abscesses can be expected to occur in any part of the lung. This is actually the case.

As aspiration or inhalation of infected material is the commonest cause, the smaller peripheral bronchioles will be the commonest sites of the disease. Central lung abscesses suggest that the abscess probably results from necrosis in some pre-existing lesion. With increase in size, a lung abscess will tend to reach the periphery of the lung.

BACTERIOLOGY OF LUNG ABSCESS

The bacterial flora of an abscess will depend on the cause. It is unusual to find a pure growth of a single organism.

Pure growths of organisms may occur in an abscess which commences as a simple inflammatory condition, such as an abscess complicating a pneumococcal pneumonia. As soon as the abscess cavity establishes communication with a bronchus, a host of mixed organisms supervenes on the primary infection. Anaerobic and aerobic organisms may be present, and spirochaetes of a variety of types soon produce the putrid odour of a lung abscess.

If infection from a septic tonsil is aspirated into the lung, a mixed infection is usually present from an early date.

Pneumococci, streptococci, Friedlander's bacilli and spirochaetes are the most commonly encountered organisms.

A feature of the tuberculous abscess is that secondary invading organisms are not commonly seen, and tubercle bacilli can usually be recovered in almost pure culture.

Because of the various infecting organisms, lung abscesses have been classified as putrid and non-putrid abscesses.

SYMPTOMS

The constitutional symptoms are those associated with the presence of acute suppuration. Malaise, anorexia, pyrexia and rigors are common general symptoms.

Special symptoms which draw attention to the lung as the site of the lesion are cough, sputum, pain and dyspnoea. Cough may be the first symptom, though many adult males, believing that the cough is due to excessive tobacco smoking, will not seek advice until some other symptom presents itself.

Sputum, which may be absent at first, may suddenly be produced when the abscess empties itself into a bronchus. Initially, the sputum may be slightly blood-stained, to be followed by mucopurulent sputum mixed with blood. The sputum soon becomes offensive, and the breath may be equally malodorous. The patient may complain of an offensive taste in the mouth, but strangely enough they are often unaware of the taste and smell of their putrid sputum.

Dyspnoea is often a very early symptom and may be quite marked even though very little lung tissue is involved. It is postulated that there is embarrassment of the normal respiratory elevation and depression of the mediastinum, due to enlargement and fixation of the mediastinal lymph glands. This makes breathing a conscious effort, and the breathing is laboured.

Generally, pain is not present unless there is an associated pleurisy. Consequently it is a late symptom, if it occurs at all.

THE PHYSICAL SIGNS

These may be well marked if there is a large abscess close to the surface of the lung. When the abscess is still small and surrounded by normal lung tissue, the signs may be vague or absent.

The cardinal feature is that there is no mediastinal displacement. This central position of the mediastinum is one of the salient points in the differential diagnosis.

Patients will often state that they can feel that the sputum and mucopurulent material is arising from one or other lung. This is usually an unreliable statement. The patient can, however, state that when he turns on to a particular side he expectorates sputum, as it is usually from the uppermost side that the sputum escapes.

With large, well-developed abscesses, the physical signs may positively indicate the clinical condition. The trachea is central, and from the site of the apex impulse the mediastinum may be judged to be in its normal central position.

Respiratory movement of the affected side is usually restricted. This may be due to one of several causes. If the abscess is peripherally situated, the visceral and mediastinal pleurae become attached. The movements of respiration are checked by this attachment, as normally the lung glides over the parietal pleura. If the inflammatory process has extended through the parietal pleura, active pleurisy will be present. Breathing may be painful, due to referred pain from the extra-pleural ramifications of the intercostal nerves. The reflex fixation of the chest wall ensues, which serves to relieve the pain.

When an abscess has become chronic, the regional bronchial and interbronchial lymph nodes become enlarged and involved in the inflammatory reaction. Normally, the mediastinum is pulled downwards by the contraction of the diaphragm with respiration, but the enlarged, infected, bronchial lymph nodes may have caused fixation of the mediastinum to the surrounding

rigid vertebral column, with resulting laboured or restricted breathing.

Palpation usually confirms the facts determined by inspection. Vocal sounds may be increased as the solid inflammatory tissue is a good conductor, ably transmitting the voice sounds from the larynx to the chest wall. If the abscess is large enough, a definite area of dullness may be detected on percussion.

The breath sounds may be bronchial in character over the abscess area. This is due to the fact that breath sounds are well conducted by the inflammatory tissue, which may be regarded as a solid medium. If there is free communication between the abscess and a large bronchus, the breath sounds may be amphoric. Post-tussive suction is a clear indication of the presence of a cavity.

SPECIAL INVESTIGATIONS

Although the history, signs and symptoms may suggest the presence of a lung abscess, further special investigations are usually necessary.

(a) *Radiography of the Chest.* This investigation will give a great deal of information. Primarily, good conventional postero-anterior (P.A.) and appropriate lateral views must be obtained. Two types of radiographic appearances may be described.

Firstly, there is the typical, characteristic shadowing in the lung, due to a lung abscess. This shadow is rounded, and contains a cavity with a fluid level. The wall of this cavity is thick, but the surrounding lung tissue has a normally translucent appearance. An abnormally large shadow may be present in the region of the hilar lymph nodes, which drain the area of lung in which the abscess is situated.

Secondly, a less characteristic shadow may occur, which shows no evidence of a fluid level. It is usually well defined, and may be rounded or conical in shape. The apex of the cone points towards the hilum, the base is towards the periphery. Unfortunately, the shadow may be due to a bronchial carcinoma. To complicate matters further, a small bronchial carcinoma may have caused bronchial obstruction, with a supervening lung abscess.

Radiological examination is incomplete unless the patient is also examined under the fluorescent screen.

(b) *Tomography.* Special extra-radiographic views may give additional information. Thus, a penetrating view of the chest may demonstrate a cavity within the shadow. This may also be shown by tomography.

(c) *Bronchography.* This may show the presence of a lung abscess, which cannot be demonstrated by other means. Iodised oil will enter an abscess cavity and then pool in the cavity space. This is shown by the presence of globules of iodised oil in the cavity space. If bronchography is not employed as a diagnostic means, it will certainly be necessary at a later stage, in order to determine the extent of the residual damage. No treatment is complete until this has been done. Generally, bronchography is not used in cases of acute lung abscess, but is reserved for the chronic type of the disease.

(d) *Haematological Examination.* A full examination of the blood is always necessary. The red cells normally show the ordinary response to inflammation by an anaemia of the hypochromic type. The differential and total white cell count is particularly important, and its interpretation may be most misleading. A leucocytosis is common in the early stages of abscess formation, and a count of about 40,000 cells per c.mm. is not uncommonly seen. This fits in with other types of pyogenic infection.

A normal white cell count may be obtained once the abscess starts to drain. This finding is therefore common in old-standing cases.

Unfortunately, a leucocytosis may occur with a carcinoma of the bronchus, where there is necrosis of the centre of a growth, or where there is associated bronchial obstruction with abscess formation.

The differential leucocyte count is an important investigation, as it may give information regarding the etiology of the lung abscess. The ordinary pyogenic lung abscess shows a polymorphonuclear leucocytosis without any important change in other cell members.

An eosinophil increase is found in amoebic abscesses of the liver when these have penetrated the diaphragm to involve the lung. An increase in the count of more than 400 eosinophils per c.mm. may also be found in infected hydatid cysts which have formed lung abscesses. This eosinophilia is one of the more constant findings in amoebic and hydatid infections.

(e) *Sputum.* Examination of the sputum is as important as the first two of these special investigations. A characteristic foetid odour to the sputum may be present, particularly associated with the group of abscesses described as putrid lung abscesses.

Mucopurulent foetid sputum is characteristic. Blood staining or even frank haemorrhage may be symptoms of lung abscess.

There is often a characteristic appearance of sputum when a hepatic amoebic abscess ruptures through into the lung. The textbooks describe it as ' anchovy sauce ' in colour. In the cases treated here, the sputum has had a large amount of blood staining, but nothing more characteristic (Fig. 5).

Microscopic examination of the sputum should always be performed, to ascertain the bacterial content of the sputum. Special reference must also be made to the examination for tubercle bacilli and carcinoma cells. The sputum should be cultured, and the sensitivity of pathogenic organisms to penicillin, streptomycin, Chloromycetin and Aureomycin should be determined.

Case 4. Mr. G., aged 33 years, complained of cough, purulent sputum and fever. The symptoms were of sudden occurrence. No previous history of ill health was obtained.

He looked ill and had a temperature ranging between 98° and 101° F. The left side of the chest showed restricted movement, the percussion note was impaired, and the breath sounds were bronchial in nature.

Radiography showed loss of translucency of the lower lobe of the left lung. A large cavity was present.

Sputum Examination. Tubercle bacilli were found in large numbers.

Comment. This case of lung abscess was tuberculous in origin.

(f) *Bronchoscopy.* It is almost axiomatic to say that all cases of lung abscess should have a bronchoscopic examination. Many authorities have stated that an

attempt should be made to drain the lung abscess at the time of bronchoscopy.

Bronchoscopy should be done to determine whether a foreign body or a carcinoma is the root cause of the abscess. Occasionally the bronchus through which the abscess is draining may be seen.

If it is not possible to see into a bronchus, it is unwise to attempt to pass an aspirating tube. This procedure is potentially dangerous, if one cannot directly see the passage of the tube, and the advantage of being able to drain an abscess at bronchoscopy is completely outweighed by the attendant risks of such a manoeuvre.

Bronchoscopy should be regarded as a diagnostic

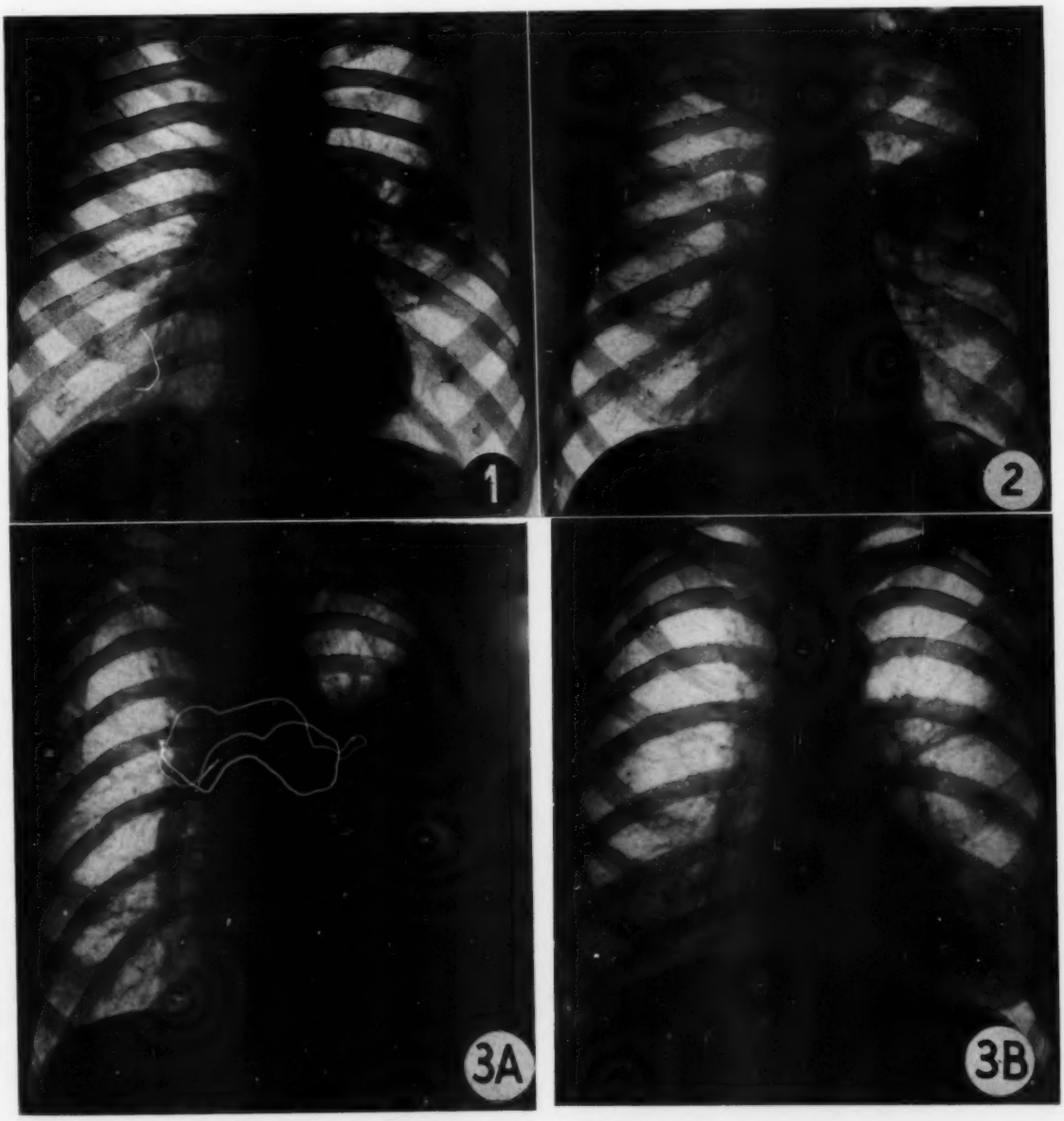


Fig. 1 (*Case 1*). Chronic lung abscess resembling a carcinoma of the bronchus.
Fig. 2 (*Case 2*). Carcinoma of a bronchus closely resembling the abscess in Fig. 1. The histories of the patients were very similar.
Fig. 3A (*Case 3*). A large abscess in the left mid-zone occurring during an attack of scarlet fever.
Fig. 3B (*Case 3*). Dramatic resolution of the abscess after large-dosage therapy with antibiotics.

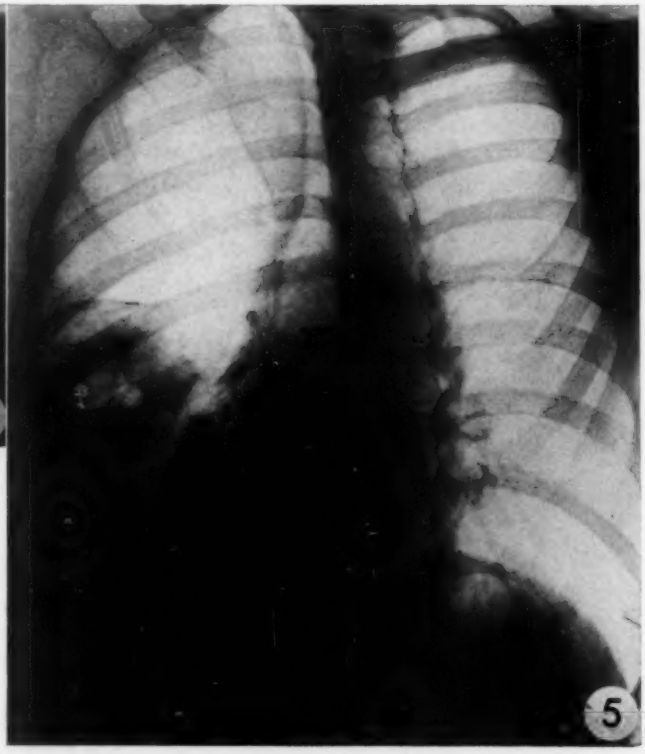


Fig. 4. An abscess involving the apex of the lower lobe and the posterior segment of the upper lobe. The position of the abscess indicates the influence of gravity.

Fig. 5 (*Case 5*). A large lung abscess causing profuse, blood-stained sputum. No response to antibiotics. After resection of lobes, amoebae were found in the walls of the abscess.

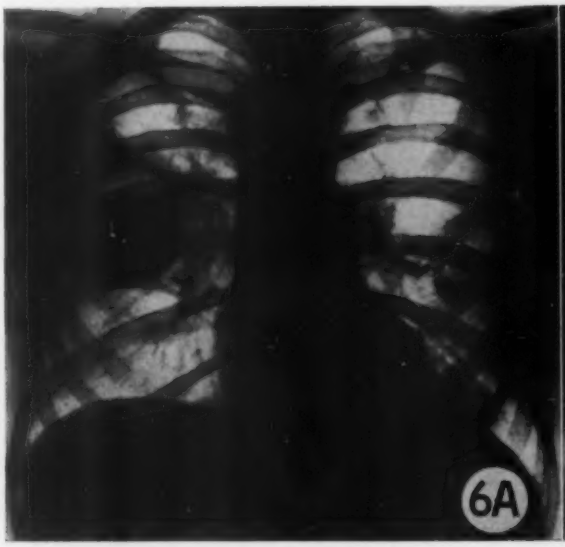


Fig. 6A. This patient had a boil on the arm. A few days later pulmonary abscesses appeared on both sides (Dr. D. P. Marais' case).

Fig. 6B. After large dosage of antibiotics lung abscesses were replaced by thin-walled 'cysts' (Dr. D. P. Marais' case).

procedure. The information obtained by bronchoscopy in correlation with the radiographic appearances, should facilitate the localization of the anatomical site of the disease.

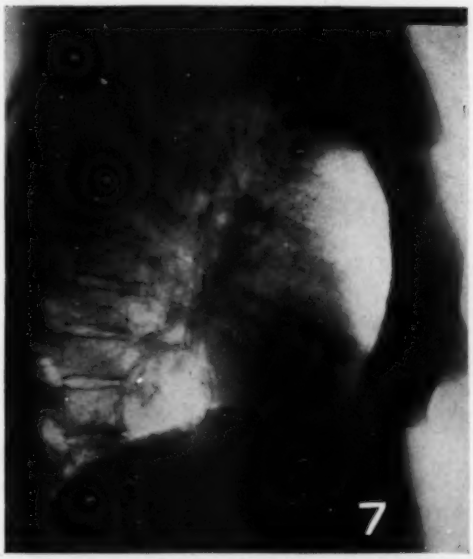


Fig. 7. A cyst-like space overlying the diaphragm is all that remains of the evacuated hydatid cyst.

THE PROGRESS AND COMPLICATIONS OF LUNG ABSCESSES

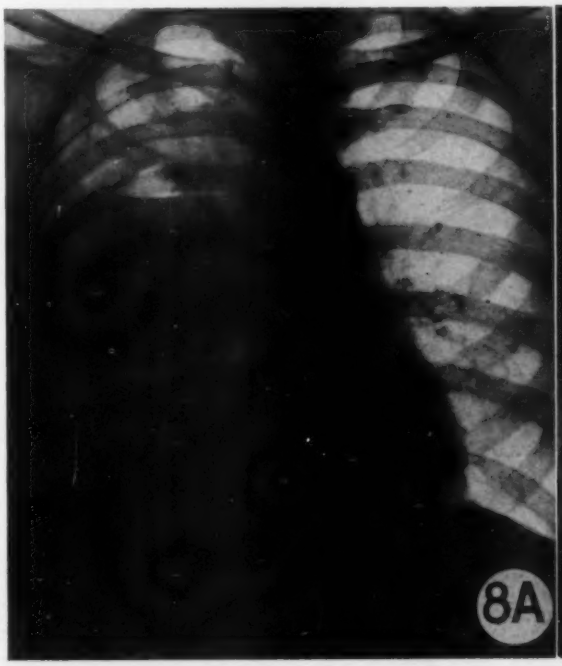
(a) *Resolution.* As with inflammation and abscess formation elsewhere in the body, complete resolution of the abscess may occur. This must happen in many cases, particularly in abscesses of the upper lobes, where the contents are able to escape more easily and completely with the aid of gravity.

(b) *Extension.* The abscess may extend through lung tissue, advancing from the involvement of an entire lobe to the state of massive necrosis of the lung. Such extension may affect the pleural or pericardial cavities.

(c) *Incomplete Healing.* This is frequent. The abscess may apparently clear up, and ordinary radiographic examination shows no sign of its presence. Considerable damage to a bronchial wall may have occurred, and the normal bronchus may have been converted into an enlarged, ragged space. This may be regarded as a form of bronchiectasis leading to chronic ill health and invalidism.

(d) *Conversion into a Chronic Lung Abscess.* Where there is persistence of signs and symptoms after a 4-week period, the abscess is considered chronic. The chances of a chronic lung abscess resolving spontaneously are small.

(e) *Change in the Actual State of the Abscess.* This is one of the most interesting features. Epithelialization may occur and, in fact, a chronic tuberculous cavity may become lined by ciliated columnar epithelium, the final appearance being that of a cyst.



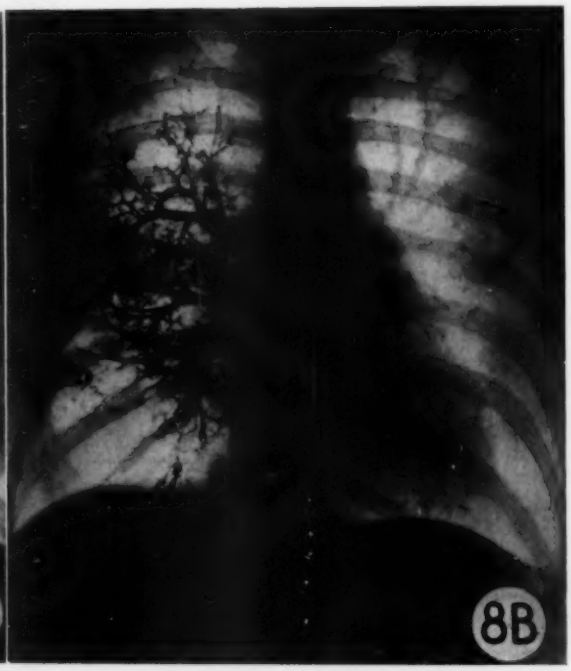


Fig. 8A. A large abscess in the dorsal division of the lower lobe. The patient was desperately ill and drainage was carried out.
Fig. 8B. Bronchography shows normal bronchi in the situation where the abscess was previously present—marked by the pin through the drainage tube.

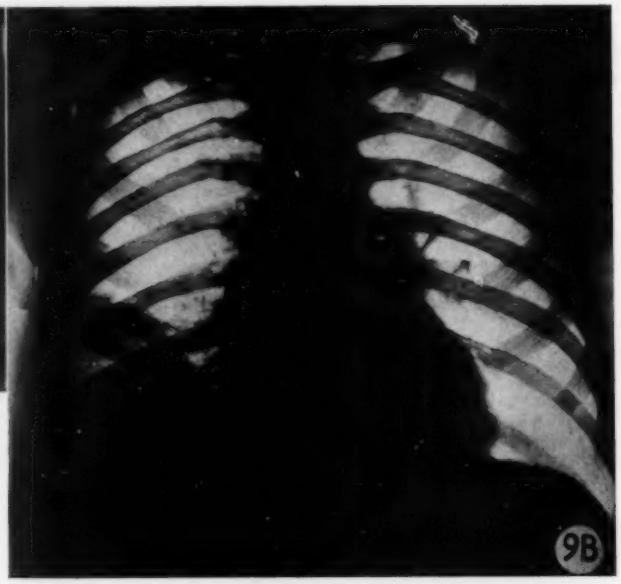
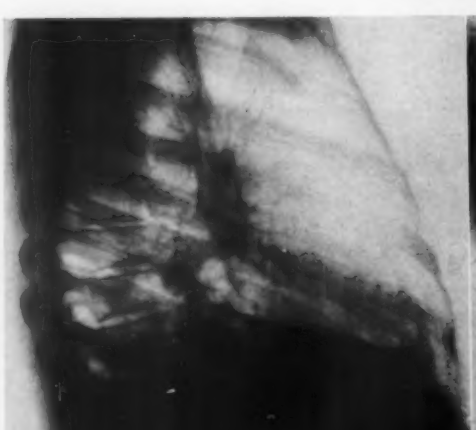


Fig. 9A (Case 6). Elevation and fixation of the right side of the diaphragm; the lung is clear. The complaint was of chest pain and there was a history of dysentery.
Fig. 9B (Case 6). The lung abscess is now visible.



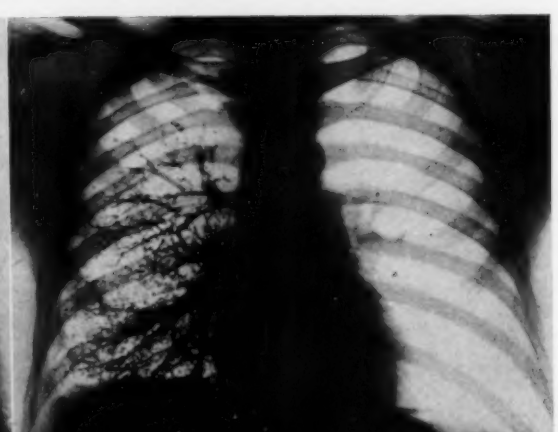


Fig. 9C (Case 6). A lateral view showing the lung abscess and the elevated fixed diaphragm.
Fig. 9D (Case 6). Showing a normal bronchogram after treatment with emetine.

Figs. 6a and 6b demonstrate this point. In this case embolic abscesses of the lung have changed into cysts according to the radiographic appearances. It may be argued that originally these were cysts which had become secondarily infected, but the history and the radiographic appearances are all against this conception.

It is quite reasonable to expect bronchial epithelium to grow down and line a space, particularly if all local infection has been removed. This view supports the idea that a patient should be very carefully checked up before he is discharged as a cured case of lung abscess.

Mrs. M. (Fig. 7) shows that a spontaneously evacuated hydatid cyst can leave behind a thin-walled, adventitial space which, when lined with squamous epithelium, gives a cyst-like appearance. On the other hand, a similarly evacuated hydatid cyst may leave

behind a space which, with superadded infection, may resemble a lung abscess in all respects.

(f) *Haemorrhage.* This complication may occur at any stage in a lung abscess. If it is due to the ulceration of a large vessel, a sudden severe haemorrhage may lead to the death of the patient within a few moments.

(g) *Embolic Abscesses.* These generally occur in the brain and are due to infected emboli or thrombi breaking loose in a pulmonary vein. They are carried to the heart by the blood stream, thence to the aorta, from where they ascend to the brain.

(h) *Amyloidosis.* Amyloid disease is a complication of lung abscess, as it is with other chronic suppurative, pulmonary conditions. An interesting point is that, though the development of the abscess may have taken years, once it is treated and cleared, there is recession of the amyloidosis within a few months.

THE DIFFERENTIAL DIAGNOSIS

Two conditions are of paramount importance in the differential diagnosis of lung abscess.

1. CARCINOMA OF THE BRONCHUS

The following three findings as a result of special investigations should conclusively confirm the presence of a carcinoma of the bronchus.

(a) *Tumour Cells in the Sputum.* These cells may be most difficult to distinguish. Claims have been made that carcinoma cells have been found in nearly all cases of bronchial carcinoma examined. The technique is a special one and the examination for, and the recognition of, the cells calls for considerable experience.

(b) *The Presence of a Tumour Mass at Bronchoscopy.* This will also be an incontrovertible finding. A lung abscess may also be found, but it is then of secondary importance.

Unfortunately, a peripherally situated small bronchial carcinoma may not be visible at bronchoscopy, so a negative finding does not exclude its presence.

(c) Bronchographic evidence of a filling defect in a bronchus related to a pulmonary shadow is almost conclusive evidence of a carcinoma. This sign is not always or often present. The hold-up and filling defect shown by the iodized oil will also help in the localization of the tumour.

The presence of foul purulent sputum, often blood-stained, with or without a leucocytosis, is not a conclusive sign of carcinoma, nor of lung abscess, as Cases 1 and 2 show. In these cases the history, physical signs, radiographic and bronchoscopic signs were identical, and a correct diagnosis was only obtained on histological examination of the lung after pneumonectomy.

2. BRONCHIECTASIS

Bronchiectasis is the second important condition to be differentiated from lung abscess. There may be an abscess associated with the bronchiectasis, but the typical bronchographic appearances of dilated and crowded bronchi should establish the diagnosis.

3. EMPYEMA

Special types of empyemata may present difficulty.

(a) *Interlobar empyema* may lead to confusion in diagnosis, particularly when the empyema drains through a bronchus. Bronchography is particularly useful in this diagnosis, for the peripheral margins of the lobes will be shown, displaced by the collection of pus in the fissure between them.

(b) An *encysted empyema,* draining incompletely through the substance of the lung, may resemble a peripheral lung abscess very closely. Bronchography assists in the differentiation. The terminal bronchioles outlined by the iodised oil are seen to be displaced by a rounded shadow, extra-pulmonary in position.

MEDICAL TREATMENT *

All cases should be treated at rest in bed. The treatment must be considered under the two main headings, medical and surgical. The introduction of the different anti-biotics has led to radical changes in the treatment of lung abscess.

It may be said that no case should have surgical treatment until adequate medical therapy has been given. Many patients show marked general or constitutional symptoms, and general measures of treatment such as blood transfusion may be necessary, apart from the treatment of the abscess.

The special investigation of bronchoscopy may be part of the treatment, e.g. an inhaled foreign body must be removed before any direct attempt is made to treat the abscess itself.

Antibiotics and Drugs. The sensitivity of the causal organisms in the sputum to the various antibiotics must be determined. Irrespective whether the abscess is acute or long-standing, a vigorous course of treatment should be started. A patient who has been given penicillin injections of 200,000 units twice or thrice daily without any effect, may show dramatic improvement when this dose is increased.

Parenteral Injections. Intramuscular injections of one million units of penicillin every six hours, and 0.5 gm. of streptomycin every 12 hours, have given the best results. The injections of penicillin and streptomycin can be given together, and ordinary penicillin should be used. This treatment should extend over a 10-day period.

Aerosol Antibiotics. During the time of administration of the intramuscular injections, inhalations of penicillin and streptomycin should be given twice daily. One hundred thousand units of penicillin and 0.25 gm. of streptomycin are dissolved in 5 c.c. of water, which is vaporized and inhaled.

Radiographic Follow-up. After 10 days of treatment, a new set of films should be available for comparison. There is usually a definite reduction in the size, and an improvement in the appearance of the radiographic shadows.

Further Treatment. The treatment should be continued as long as improvement is shown on the radiographs. It is not necessary to continue giving massive doses of the drugs, and the dose should be reduced to one million units of penicillin and 0.5 gm. streptomycin twice daily.

Inhalations should be continued as long as there is cough and sputum.

* The treatment of proved tuberculous cases is not included in this article.

Resistant Organisms. Although organisms may be found resistant to the drugs on bacterial culture, a 10-day course of vigorous treatment should still be given. If there is no radiographical improvement at the end of this period, the other antibiotics such as Aureomycin, Chloromycetin, Terramycin and the sulpha group of drugs, should be used.

Postural Drainage and Breathing Exercises. These methods have no place in the treatment of the acute lung abscess. The patient is often desperately ill, and postural drainage, percussion of the chest and coughing exercises are distressing and useless to him. In the old-standing case, postural drainage may assist an already draining abscess.

Cessation of Medical Treatment. This should be discontinued when the abscess has disappeared on ordinary radiographic examination, or when the abscess has failed to show any further improvement. Although the patient may feel well, be symptomless and afebrile, the presence of cavitation on the radiographs is an indication for more radical treatment.

SURGICAL TREATMENT

Surgical treatment should be reserved for those cases which have failed to respond to adequate medical treatment.

If no radiographic evidence of improvement is seen after four weeks of treatment, surgical assistance is then required. This applies to both acute and chronic abscesses.

Case 5. Mr. T. de B., an Orange Free State farmer aged 35 years, had sudden onset of a 'cold', which improved with Sulphadiazine. One month later:—recurrence of the cough, no sputum, dyspnoea at rest, pain in the right scapular region marked on deep breathing and coughing. He perspired freely; temperature of over 100° F. He improved again on Sulphadiazine. One month later the symptoms were severe in nature, and treatment did not help. He was admitted to hospital where a pleural effusion was diagnosed, and four pints of bloody fluid removed, leading to improvement in his condition. When he got up for the first time, he had a severe haemoptysis of one pint of pure blood. Haemoptyses recurred. There was a previous history of measles at age of eight. No other illness.

There was evidence of recent loss of weight. There was diminution of movement of the right side of the chest. The percussion note was dull over the lower zone, and diminished breath sounds were obtained over the dull area. A few crepitations were heard.

Special Investigations. The *blood count* showed no characteristic changes.

Sputum examination showed a mixture of organisms. No carcinoma cells or tubercle bacilli.

The Wassermann Reaction was negative.

X-ray examination showed a large, ill-defined shadow in region of the right middle lobe. The radiologist was suspicious of a pulmonary carcinoma. Subsequent films showed cavitation in the centre of the shadow suggestive of either abscess formation or necrosis of a tumour.

The patient showed no clinical nor radiological response to penicillin and streptomycin injections.

He was admitted to the Chest Unit, where bronchoscopy was carried out. Blood-stained material was found issuing from the middle lobe bronchus. Nil else of note.

Operation. Right, middle and lower lobectomy. The two lobes were found to be densely adherent and adherent to the diaphragm.

Histological Examination of the Lobes. Amoebic abscess of the lung, amoebae being found in the wall of the abscess.

Comment. This patient has gained 70 lb. in weight and is quite fit. The differential diagnosis was lung abscess or carcinoma of the bronchus. The specialist physician who referred this patient for treatment considered the question of amoebiasis, but obtained no assistance from the investigations.

The Extent of the Inflammatory Process. It is most important to know exactly the extent of the lesion, which bronchopulmonary segments have been affected, and which are normal. Bronchography assists in supplying the requisite information.

Type of Surgical Treatment. This may be the removal of the affected segment, lobe or lung. No attempt will be made here to describe resection of the lung or its parts, as this is a standard procedure. The pre- and post-operative treatment is the same as that used in the treatment of bronchiectasis.

Surgical treatment is usually given to cases falling into the chronic category, which have failed to respond to medical treatment. Some authorities continue vigorous medical treatment for many months, hoping thereby to avoid surgical treatment. One should always consider the question of morbidity, as after prolonged medical treatment many patients have been converted into what are referred to as 'respiratory cripples'. The fixation and crowding of the ribs, and the immobility of the chest wall give rise to thoracic deformity, which reduces the vital capacity.

THE PLACE OF SURGICAL DRAINAGE IN THE TREATMENT OF LUNG ABSCESS

This method of treatment occupies a mid-position between medical treatment and resection of affected lung tissue.

Indications for Drainage. The desperately ill patient, with a large incompletely draining lung abscess may require surgical drainage (Figs. 8a, 8b). The equivalent condition to this in the abdomen is the case of peritonitis where the purpose of treatment is to initiate drainage, which eases the patient until further treatment can be given. At this stage actual cure of the condition is of secondary importance.

Simultaneously, all anti-bacterial measures must be used. Similarly, the best initial treatment for an enormous lung abscess is drainage. An enormous lung abscess may appear to involve an entire lobe or lung, yet after drainage and post-operative bronchography, much of the lung tissue may be found to be healthy, and worthy of conservation. Drainage is also important because the patient may cough up his lung abscess at any time, and if this were to happen during sleep, he might well drown.

Although many surgeons have regarded cases as cured by drainage alone, this method of treatment is usually an intermediate step. Subsequent resection often becomes necessary, bronchography indicating the extent of the residual damage.

Time for Drainage. This depends on the patient's condition and the size of the abscess. There should not be a delay in drainage because the patient has not completed an adequate course of medical treatment, as he may die from drowning or toxaemia during this period.

Method of Drainage. Careful radiographic localization generally allows of direct drainage of the abscess as a one-stage operation. Operative technique will not be discussed except to state that it is best carried out

with the patient in a semi-sitting position, in case the abscess ruptures into a bronchus during the operation.

THE CASE OF UNCERTAIN ETIOLOGY

It is often impossible to decide whether a case is one of carcinoma of the bronchus or a chronic lung abscess. These doubtful cases may have failed entirely to respond to medical treatment, or may have only shown improvement up to a point. The diagnosis may only be obtained at operation.

It should be stressed, however, that the firm, hard feel of a chronic lung abscess may resemble that of a carcinoma. It is, therefore, essential that every resected segment or lobe should be examined as soon as it is removed from the chest. The surgeon should have the specimen opened up before him, and if there is any doubt from the macroscopic appearances, the case should be regarded as a carcinoma and treated accordingly.

This examination during the operation is important, and the bronchi should be slit open, inspected, and palpated.

THE POST-TREATMENT PERIOD

The post-operative course of a patient is similar to that for patients treated by resection for other conditions, and does not call for comment.

The post-treatment course of the patient, who has not been surgically treated, is particularly important. The medical treatment of lung abscess may result in restoration to normal, as assessed by ordinary radiographic appearances. These appearances may be misleading, because residual bronchiectasis demonstrable only by bronchography, may be present.

Post-Treatment Bronchography of Medical Cases. Bronchographic examination of a patient should be completed before his discharge from hospital.

This examination may show only one dilated or bronchiectatic area, from which site there may in the future be a repetition of the exact sequence of events. Consequently, resection of the lobe containing the residual bronchiectasis should always be performed.

TREATMENT OF LUNG ABSCESS DUE TO RUPTURED AMOEBIC LIVER ABSCESS

A history of amoebic dysentery may be obtained, or an examination of the stools may show the actual presence of amoebic cysts.

In the South African, amoebiasis is a common cause of basal lung abscess and there is usually failure to improve on treatment with antibiotics alone.

A basal lung abscess associated with a fixed diaphragm should always suggest the possibility of amoebiasis as the cause, even though the findings in the stool are negative. A course of emetine treatment should be given. An amoebic lung abscess responds to emetine surprisingly quickly, frequently leaving only a minimal degree of residual damage in its wake (Figs. 9a, 9b, 9c, 9d).

Case 6. Mr. G. S., aged 33 years, complained of pain in the lower part of his chest. There was no cough or sputum, but a slight temperature was present. There was a past history of dysentery during army service.

Radiographic examination was normal. Four weeks later the pain had become worse, and some cough was present. There was diminished movement of the right side of his chest. Nothing else of significance was noted.

Radiography demonstrated elevation of the diaphragm on the right side, and screening showed much diminished movement. Subsequent radiographs showed the presence of a lung abscess, one of these films showing this abscess as an extension through the diaphragm from the liver. Simultaneously the patient started producing blood-stained sputum.

Although no absolute evidence of amoebiasis was obtained, he was started on a course of emetine hydrochloride. The response was dramatic and within two months all the signs and symptoms had cleared.

Bronchography showed an almost normal bronchial pattern. Some dilatation was seen in one bronchiole.

Comment. This case demonstrates the resolution of an amoebic liver abscess which ruptured through the diaphragm causing lung abscess.

It is possible that damage to the lung which has been started by amoebic infection, of which no further evidence persists may be continued as an ordinary pyogenic lung abscess. If the abscess fails to respond to a 10-day course of treatment, resection of the involved portion of the lung is indicated.

Amoebae and their cysts have been found in the walls of lung abscesses.

PROGNOSIS

Lung abscess, when untreated, must be regarded as a fatal condition. Death may occur in the acute stage of the disease, or it may be preceded by a long period of chronic ill health. Spontaneous recovery of cases is not commonly seen.

Modern methods of treatment which are a combination of adequate medical and surgical therapy have reduced the mortality of lung abscess to under 5%.

The question of morbidity, however, must be further considered. Many patients can be kept alive while suffering from recurrent attacks of pulmonary suppuration. These are usually patients who have received adequate medical treatment in the initial stages of their illness, but have been left with the abscess partly unhealed, or with some degree of residual bronchiectasis.

When the treatment of these cases is completed by the requisite form of surgical procedure, total recovery can generally be anticipated.

Lung abscesses occurring in elderly patients carry a high mortality because of the additional complications of myocardial insufficiency.

Briefly, the combination of early diagnosis with skilled medical and surgical attention ensures a good prognosis for the patient suffering from lung abscess.

SUMMARY

Lung abscess is a relatively common condition. It may be produced by a variety of causes.

In the European, difficulty is often encountered in distinguishing between carcinoma and chronic lung abscess.

In South Africa amoebiasis is commonly seen especially in the Bantu. It may cause a right basal lung abscess with fixation of the diaphragm.

The mortality of the disease has been greatly reduced by modern methods of treatment.

Treatment of a case of lung abscess is incomplete without a final bronchography to exclude residual lung damage.

VERENIGINGSNUUS : ASSOCIATION NEWS

THE SOUTH AFRICAN MEDICAL AND DENTAL COUNCIL: REGULATIONS RELATING TO INTERNS

Government Notice No. 2006 of 18 August 1950

His Excellency the Officer Administering the Government has been pleased under the powers vested in him by section *twenty-five* of the Medical, Dental and Pharmacy Act, 1928 (Act No. 13 of 1928), as amended and, after considering a recommendation of the South African Medical and Dental Council, to make the following regulations relating to interns:—

1. Any person who holds a degree, diploma or certificate recognized by the Council in terms of regulations framed under the provisions of sections *twenty-two* and *twenty-three* of the Act shall, after obtaining such degree, diploma or certificate and before he is entitled to registration as a medical practitioner, undertake training as an intern for a period and in manner hereinafter prescribed; provided—

(*a*) that this shall not apply to the holder of any degree, diploma or certificate obtained prior to 1 November 1948;

(*b*) that a person holding a degree, diploma or certificate mentioned in the regulations framed under the provisions of sections *twenty-two* and *twenty-three* of the Act who has, since obtaining the said degree, diploma or certificate, performed in any country other than the Union of South Africa at appropriate institutions, training of a like nature to that hereinafter prescribed for interns; or who has practised in such country as a medical practitioner by virtue of the said degree, diploma or certificate for such period and under such circumstances as may afford him experience and training of a like nature to that required of an intern; shall be entitled, upon submitting proof that he has undergone such training to apply for registration as a medical practitioner; and if the Council is satisfied of the performance of such training or the conduct of such practice, and that the said training or practice is substantially equivalent to the training and experience hereinafter prescribed for an intern, may exempt such person from the requirement of registering and training as an intern;

(*c*) a person holding a degree, diploma or certificate not mentioned in the regulations framed under the provisions of sections *twenty-two* and *twenty-three* of the Act, but who holds such other degree, diploma or certificate as may from time to time be approved by the Council, and who has since obtaining the said degree, diploma or certificate performed in any country other than the Union of South Africa, at appropriate institutions, training of a like nature to that hereinafter prescribed for interns, or who has practised in such country as a medical practitioner by virtue of the said degree, diploma or certificate for such period and under such circumstances as may afford him training of a like nature to that required of an intern; and who subsequently has obtained a degree, diploma or certificate mentioned in the regulations framed under the provisions of sections *twenty-two* and *twenty-three* of the Act, may apply for exemption from the requirement of registering and training as an intern and if the Council is satisfied of the performance of such training or the conduct of such practice and that the said training or practice is substantially equivalent to the training hereinafter prescribed for an intern, may exempt such person from the requirement of registering and training as an intern.

2. The training to be undertaken by an intern shall be as hereinafter described, namely—

(*a*) the training shall be of not less than one year's duration, and where it is broken or interrupted it shall consist of periods which, when added together, are not less than one calendar year in total, including leave not exceeding one month's duration;

(*b*) the training shall be undertaken as an intern in an institution recognized and approved by the Council for the purpose provided that in the event of facilities in an institution not being available, the Council at its discretion, may accept such other or alternative training as in its opinion is equivalent in value to training in an institution recognized and approved by the Council. The Council in recognizing such institution or alternative training, may stipulate that only a proportion of an intern's training shall be undertaken thereat, and that the remainder shall be undertaken in another institution;

(*c*) before any training is undertaken which shall rank as such for computing the year or period of training, it shall be approved by the Council and be subject to inspection by the Council;

(*d*) should the Council at any time during such training regard the same for any reason as inadequate or unsatisfactory, the Council may withdraw further approval thereof and require other or alternative training to be undertaken in lieu of the remaining period.

SOUTH AFRICAN MEDICAL AND DENTAL COUNCIL: RULES REGARDING THE REGISTRATION OF INTERNS

Government Notice No. 2007 of 18 August 1950

The Minister of Health in exercise of the powers conferred on him by sub-section (4) of section *ninety-four* of the Medical, Dental and Pharmacy Act, 1928 (Act No. 13 of 1928), as amended, has approved of the following rules regarding the registration of interns made by the South African Medical and Dental Council under sub-section (2) of the said section of the Act:—

1. The register of interns established by the Council in terms of the provisions of the Act shall reflect *mutatis mutandis* all such information as is recorded in the register of medical practitioners kept by the Council.

2. An applicant for registration as an intern shall submit to the Council—

(*a*) proof that he holds a degree, diploma or certificate recognized by the Council in terms of regulations framed under sections *twenty-two* and *twenty-three* of the Act;

(*b*) evidence in writing that he has obtained an appointment recognized by the Council for the purposes of internship;

(*c*) evidence in writing that he has accepted the said appointment;

(*d*) a formal application for registration as an intern;

(*e*) the registration fee of £2 laid down in the Act.

3. The intern shall notify the Council beforehand if he intends to change from the recorded place of his service or training to another place.

4. Interns shall be subject to all the rules of professional conduct prescribed by the Council for medical practitioners.

5. Upon completion of the training undertaken by an intern he shall establish by certificates or otherwise to the satisfaction of the Council, that he has duly undertaken such training as prescribed by the Council and his doing so shall be a condition precedent to his registration as a medical practitioner.

IN MEMORIAM

DR. S. F. SILBERBAUER

The late Dr. Stanley Frederick Silberbauer was born in Cape Town on 15 April 1889 and attended the South African College School. He received his medical education at the Edinburgh University where he qualified for the degree of M.B., Ch.B. in 1911, afterwards serving as house physician to the late Sir Robert Philip at the Royal Infirmary, Edinburgh.

On his return to South Africa he was appointed a resident physician at the New Somerset Hospital.

Early in 1914 he received the degree of M.D. of Edinburgh and the diploma of M.R.C.P., Edinburgh.

The following years were spent on active service as a member of the South African Medical Corps in the East African Campaign.

At the conclusion of hostilities he commenced general practice in Cape Town.

In 1920 he married Miss Agnes Bam, daughter of the late Mr. H. A. Bam of Cape Town.

He sold his practice in 1924 on account of ill health and spent a year in Switzerland.

He was elected a Fellow of the Royal College of Physicians of Edinburgh in 1925, and on his return to South Africa in that year he practised as a specialist physician, being appointed

additional physican to the New Somerset Hospital. He was never a robust man and ill health forced him to resign his appointment in 1930.

Always a staunch member of the Medical Association, Dr. Silberbauer served on numerous committees of the Cape Western Branch and was President of the Branch in 1934.

His wife predeceased him and he is survived by four children, two sons being medical students.

Dr. D. P. Marais writes: In the passing of Stanley Silberbauer at the mature age of 61, the medical profession has lost an eminent and an able member who combined within himself many of the attributes of dignity and ethical correctness of the bygone age of Victorian physicians, with the scientific knowledge of the twentieth century consultants. His friends, and the circle is a wide one, both without and within the profession, mourn the loss of a fine character and an example of that high standard of conduct which has always been its pride.

Silberbauer possessed, in an usual degree, a knowledge of man which tempered his advice with exceptional wisdom. He was keenly receptive, not only to the latest trends of medical science, but to all the reactions of the lay, as well as the medical community, in which he lived and worked. He kept his fingers on the pulse of our community life, and his diagnosis of social, as well as of medical disabilities, was distinguished by a broad wisdom and a correct insight. Always seriously minded and strictly correct in his professional dealings, he nevertheless possessed a large fund of quiet humour which was the delight of his friends. Of so staunch and loyal a character it would be difficult to make an enemy, and indeed he had none known to his intimates.

Graduating from the University of Edinburgh, he proceeded to his M.D., and the Membership of the R.C.P. after internships at the Royal Infirmary, Edinburgh, and the Somerset Hospital, Cape Town. He was elected a Fellow in 1925. Appointed an additional physician at the Somerset Hospital in 1914, he continued to serve there and to teach clinical medicine until indifferent health, brought on largely by severe malaria during his military service in East Africa, and an expanding consulting practice, compelled him to relinquish some of his hospital work. Despite the vicissitudes of poor health, he accomplished a full round of professional activity besides serving our Association in the Branch Council and the Federal Council during his Presidency of the Cape Western Branch.

He was associated, on its Board of Directors, with the Southern Cross Assurance Co. and held the post of Physician Consultant to the Railway Sick Fund as the last of his professional appointments.

The loss of his wife, a gentle and very able helpmate, was a severe blow to him and proved a critical event in his delicate state of health. He bore his disabilities with philosophic stoicism, fearlessly facing the inevitable without complaint.

He left three sons, two of whom are entering his profession, and one daugter, to whom we offer our condolence.

Dr. A. W. S. Sichel writes: It is with a sense of deep regret that I find myself penning these few lines in appreciation of my old friend and colleague, Stanley Silberbauer.

Our acquaintance dates back to childhood days when I can recall a birthday party held at the old home in Mowbray. Later on I had the pleasure of sharing 'digs' with him at 70 Arden Street, when we were studying medicine at Edinburgh. Those two or three years in his close company are one of the really pleasurable recollections of past days. He and I at one time were joint Honorary Secretaries of the much criticised South African Students' Union, 14 Buccleuch Place, Edinburgh, and succeeded, I think, in restoring some prestige to its then dingy reputation.

Silberbauer left Edinburgh in 1912, the year in which I graduated, and I did not see him again until 1920 when I returned to practise in Cape Town.

From that time until his death we have remained as we always were, very close friends.

I shall not be contradicted when I say that Stanley Silberbauer had no enemies and few critics among those who came in contact with him. He was a lovable character, possessed of a rich blend of humour and deep thoughtfulness, a high sense of honour and devotion to duty. Although menaced from time to time by ill health, he played his part nobly in his profession and the narrower confines of his home life.

If he had one fault, it was in his diffidence to say what he thought if in so doing he might offend a colleague.

He will be missed sadly by a host of friends and colleagues; but his example will long remain as a stimulus to all those who were privileged to know him as I did.

PASSING EVENTS

We regret to record the death of Dr. H. Pillemer, Senior Assistant District Surgeon, Cape Town.

CAPE TOWN PAEDIATRIC GROUP

The next meeting will be held in the Little Lecture Theatre at the Groote Schuur Hospital, Observatory, C.P., on Monday, 25 September 1950 at 8.15 p.m.

Dr. H. Krafchik will speak on *Common Skin Disorders of Childhood.*

NUFFIELD TRAVELLING FELLOWSHIPS FOR 1951

Dr. B. F. J. Schonland, chairman of the Nuffield Foundation South African liaison committee, announced today that the Nuffield Foundation had awarded Nuffield Dominion Travelling Fellowships for 1951 to the following medical practitioners: Dr. J. H. Louw of the Department of Surgery, University of Cape Town, and Dr. I. B. Welsh of the Department of Medicine, University of the Witwatersrand.

ERRATUM: MEDICAL AID SOCIETY TARIFF

Members are requested to note that the address of the *Mail, Times and Express Medical Aid Society*, is incorrectly stated in the new Tariff of Fees for Approved Medical Aid Societies. They are asked to amend their copies to read: P.O. Box 1138, Johannesburg.

REVIEWS OF BOOKS

A MEDICAL SECRETARY LOOKS BACK

Among the Doctors. By Alfred Cox, *O.B.E.*, LL.D. (Manitoba), Hon. M.A. (Durham), M.B., B.S. (Pp. 224. 12s. 6d.) London: Christopher Johnson.

Contents: 1. Early Days in Darlington. 2. Apprenticeship in Carlisle. 3. Apprenticeship in County Durham and in Northumberland. 4. Student Days in Newcastle. 5. General Practice in Gateshead, 1891-1908. 6. General Practice in Gateshead—2. 7. I Become an Organiser. 8. At Headquarters. 9. Lloyd George and National Health Insurance 10. Chairmen and Chairmanship. 11. Doctors and the 1914-1918 War. 12. After the War. 13. B.M.A. House. 14. Among the Doctors in Canada. 15. Among the Doctors in South Africa. 16. What is the British Medical Association. 17. Back at Headquarters. 18. Among the Doctors in South Wales. 19. Approaching Retirement. 20. The B.M.A. Goes International. 21. Some Well-known Doctors of my Time. 22. Retired, But Still 'Among the Doctors'. 23. Among the Heterodox. 24. Patent Medicines. 25. Hitler's War and My Last Job. 26. The National Health Service—A Portent.

Alfred Cox graduated the hard way. The son of working-class people, he describes in the opening chapters the early years of his life spent in Darlington, and how the opportunity to study medicine arose. The description of his experiences as an unqualified assistant to country practitioners should be noted by every present-day student in order that he may be made to appreciate the facilities that are available to him in our modern medical schools.

Bearing in mind the conditions of internship which are under consideration in Great Britain and have been made effective in South Africa, it is interesting to note Dr. Cox's statement: 'It is sometimes suggested that the system of apprenticeship should be revived but I think it is impracticable.' Coming from one with such unique knowledge of doctors and the conditions under which they work, this opinion should not be ignored by those whose duty it is to draft the necessary legislation.

His flair for organization revealed itself in 1898 when he was instrumental in forming the Gateshead Medical Association, later to become a Division of the British Medical Association. His practical knowledge of contract practice as it then existed, his efforts for its reform, and his outstanding achievement in

promoting unity in the British Medical Association, played a great part in his selection as Deputy Medical Secretary in 1908 and Medical Secretary in 1912.

Later chapters are rich in experiences during his 20 years of office and references to the notabilities of the profession are numerous and illuminating. Of particular interest to South Africans is the chapter entitled *Among the Doctors in South Africa.* It was due largely to Cox's tact and diplomacy that at Bloemfontein in 1926 the warring sections comprised by members of the Branches of the British Medical Association in the Union, and the newly-formed South African Medical Association, were induced to come together and form the Medical Association of South Africa (B.M.A.).

Among the Doctors will be read with relish by every member of the medical profession but will not be without interest to laymen. For those who are concerned with medical organization and particularly officials of the British Medical Association and its sister Associations, be they full-time or honorary, it should be a prescribed textbook.

The reviewer has happy recollections of his first meeting with Dr. Cox in Cape Town after his arrival in 1925 and has not forgotten the elephant incident on the road to Paarl which is not included in his reminiscences. It is with the greatest pleasure and gratitude that he congratulates the writer on his achievement, in the evening of his life, of so ably recording the events of a long and distinguished career.

TECHNIQUE OF MURDER BY DROWNING

The Trial of George Joseph Smith. Edited by Eric R. Watson, LL.B., *Notable British Trial Series.* (Pp. 329. 15s. 2nd. ed.) Edinburgh and London: William Hodge & Co., Ltd. 1949.

Contents: 1. First Day: Tuesday 22 June 1915. Mr. Bodkin's Opening Speech for the Crown. 2. Second Day: Wednesday 23 June 1915. Evidence for the Prosecution. 3. Third Day: Thursday 24 June 1915. 4. Fourth Day: Friday 25 June 1915. 5. Fifth Day: Saturday 26 June 1915. 6. Sixth Day: Monday 28 June 1915. 7. Seventh Day: Tuesday 29 June 1915. 8. Eighth Day: Wednesday 30 June 1915. Appendices.

The Brides in the Bath murders rank among the most novel murders ever committed. The medical evidence covers a wide range of topics and the subject of epilepsy comes in for particularly vigorous handling both in Mr. Marshall Hall's brilliant cross-examination as well as by such an eminent forensic expert as Sir (then Dr.) Bernard Spilsbury. The substance of the Crown case may be epitomized in the excellent summary for which Mr. Archibald Bodkin was responsible (p. 262): 'The three cases are of such a character that such a large aggregation of resemblances cannot have occurred without design. In each case the prisoner went through the form of marriage; in each case the ready money of the woman was either realized or drawn out of whatever deposit bank it might have been in; in each case there was a will drawn in favour of the prisoner absolutely; in each case the will was drawn by a stranger to the testatrix; in each case the victim insured her life or was possessed of property which did not make it necessary to insure her life; in each case there was a visit to a doctor shortly before the death, which, we contend, was unnecessary from the physical condition of the patient; in each case the women wrote letters to relatives the night before, or on the night on which they died; in each case there was an inquiry as to a bathroom or the provision of a bath; in each case the woman died from drowning, and the prisoner was the first to discover it; in each case the bathroom doors were unfastened and the water was not drawn off until after the doctor had been; and in each case the prisoner was putting demonstrably forward the purchase of either fish, or eggs, or tomatoes to show that he was absent from the house in which his wife was lying dead; and in each case there was the prisoner's subsequent disappearance and the monetary advantage resulting or attempted to be made to result.'

Mr. Edward Marshall Hall for the defence called no witnesses and did not put his client in the witness box; yet even his forensic genius was inadequate for this criminal occasion. Mr. Marshall Hall had some scathing comment to make on the technique of calling in as witnesses medical practitioners for the sole purpose of giving expert testimony (p. 263): 'The calling of expert medical evidence by the prosecution has opened the door to the worst form of Americanism in the administration of British justice. Had the prisoner not been the pauper he is, had he been possessed of unlimited means like some recent American criminals, he might have procured experts to say that the cause of death was other than that stated by the experts for the Crown. I submit it is a very dangerous procedure that should be watched with the greatest possible care, and an absolute limit put upon it. It has reached its extreme limit in this case. One of the oldest rules of our criminal practice is for the time abrogated, and the Crown is allowed to call expert medical evidence to contradict, to explain away, the evidence already given by other medical men who are the Crown's own witnesses.'

There is probably some substance in Mr. Marshall Hall's contention, particularly in the light of some extraordinary statements perpetrated even by the great Spilsbury. The brilliance of Dr. Spilsbury's evidence is not in dispute. His unique capacity for playing the detective must have been of considerable assistance to the police. Nevertheless, in his evidence for the prosecution, Spilsbury expressed the opinion that the existence of goose skin (cutis anserina) indicated that the death in this particular case was a sudden one. There was no mistaking this information, because subsequently in his closing speech for the Crown, Mr. Bodkin stated (p. 261): 'A reason for saying that it was a sudden death is something which the doctor and the coroner's jury did not see, and that was the "goose flesh" on the skin.'

It is clearly and commonly recognized that goose skin is only a sign of immersion and in any event could be produced in other ways. It can occur normally during the course of rigor mortis when the arrectores pili muscles become involved. Spilbury's evidence is the more remarkable as it is based on what he saw at an exhumation which he performed about two and a half years after the deceased had been buried.

There are also many medico-legal pathologists who would not agree that drowning or any other form of asphyxia can be recognized at autopsy as a pathological entity although Spilsbury and Dr. W. H. Willcox subscribed to this view.

The introductory survey by Mr. Eric R. Watson is a very competent one and forms an excellent guide to a series of murders which Mr. Watson has described as 'without a parallel in the history of crime in any age or country'.

Although some 35 years old, this case has by no means dated. Indeed, the extensive record of the medical testimony and its searching scrutiny under Mr. Marshall Hall's able cross-examination make this volume one which every medical student and practitioner should study with the closest attention. Despite some highly debatable opinions expressed by the medical witnesses, the volume is a mine of information on forensic pathology and one of the best guides to the technique of giving expert evidence in our Courts.

CORRESPONDENCE

WHY SMOKE?

To the Editor: Apropos the recent correspondence on the subject of smoking, the following extract is pertinent. It appeared in the *British Medical Journal* of 17 May 1947:

'Look again, sir, with open eyes at the grown man still sucking his pipe; at the yellow-fingered female inhaling between her paroxysms of cough, great gouts of acrid smoke into the ramifications of her bronchial tree; peer through the billowing smoke of the theatre auditorium at the serried ranks of smouldering addicts, squashing their stubs into carpet or tray, fighting with lighters, probing their pipes, and cough, cough, coughing; and then maintain, if you can, that the tobacco habit as practised today is anything better than a melancholy commentary on *Homo sapiens*.'

S. Levin, M.B., B.Ch.

42 Carnarvon Road,
Bertrams,
Johannesburg.
15 August 1950.